THE IRON TRADE REVIEW

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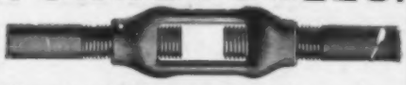

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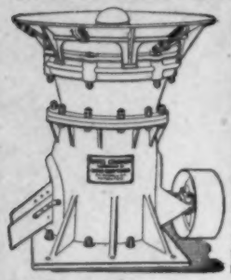

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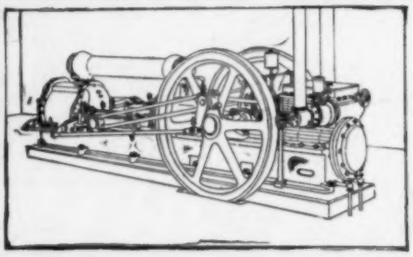

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. DECEMBER 30, 1897. CHICAGO, ILL. NUMBER 52

THE WEEK IN IRON CIRCLES.

The year ends with larger bookings of iron and steel by the principal producers, and probably with a larger aggregate for the country, than has been known at any corresponding time in the history of the trade. It is a proof of the general belief that low prices are to continue, and that if advances come, as the new year is well along, they will be very moderate—to find so heavy a tonnage of steel rails, billets, sheet bars, wire rods, and of pig iron, as is now on order books. It is another indication of the more stable basis to which prices have come, that in a month often marked by extreme weakness, when many sellers act as though the year ahead would put the use of iron out of fashion, there has been in the closing weeks of 1897, only an occasional yielding of prices and that comparatively trifling. The rail mills start upon 1898 with orders running into hundreds of thousands of tons, much of the business being taken at $18, Pittsburg, and $19 to $20, Chicago. These orders have been taken with no renewal of the disastrous war of last winter, though there has been, too, not a little crossing of the territorial lines that were established under the old pool regime. Efforts for the revival of the pool, on a price basis substantially that of to-day, but with an allotment feature that would insure to each mill a quota of business in nearest territory, are not abandoned, but there are some obstacles that are not likely to be removed, particularly in the Central Western and Western situation. In the past week the heaviest buying has been by the Lake Shore, the tonnage covering also the requirements of the P. & L. E., and the Nickel Plate. Car buying keeps up steadily and further contracts have been placed with rolling mills on this account. At the meeting of beam manufacturers in New York this week, the Carnegie Steel Co., Ltd., Jones & Laughlins, Ltd., the Cambria Iron Co., Pencoyd Iron Works, Phoenix Iron Works and the Passaic Rolling Mill Co., were represented. Prospects are better than were indicated a week ago, for some agreement. The Eastern mills, it would seem, will get most benefit from an allotment of tonnage and Western Pennsylvania interests can only be helped by a pool that would advance prices and still give them substantially the tonnage they are now getting on a competitive basis. While 1.10c Pittsburg, the present price, has been discussed as the pool basis, it is more than likely that if the arrangement is made some advance will accompany it. A large amount of new work is being figured on, and Pittsburg has closed a 6,000 ton contract for New York bridge work. Chicago Drainage Canal awards are still pending. Iron and steel bars continue to be the weak factor in finished material, .95c Pittsburg, for steel and 95c valley, for iron being quoted, with concessions on extras. The foundry pig iron situation is generally firm, apart from the concession of 25 cents on some Southern grades, in the expectation of stimulating buying and in turn lifting prices. Some Alabama sellers have quoted gray forge at $6.50 and No. 2 foundry at $7.25, but no large business has resulted as yet. Northern sellers note considerable inquiry and a fair January business is counted on. Bessemer pig iron is quiet and stationary. Sales of the past few weeks at $9.50 for the first quarter cover a considerable portion of the output of certain valley furnaces for that period. Present offers at that figure and a shade below for second quarter are not entertained. Steel billets, with large amounts booked for the first quarter, are firm at $15, Pittsburg mill, with $15.25 quoted by some sellers.

THE CLEVELAND DISTRICT.

Iron ore conferences for 1898 have begun, the first meeting being in session in Cleveland at this writing (Wednesday). All the old-range Bessemer producers are represented, including the new operators of the Norrie and the Tilden. Practically all the Mesabi range is represented also, through the interests that speak in the conference for old-range companies, but the probability of any agreement that would include the Mesabi is considered rather remote. Whether the agreement of the Marquette, Menominee, Gobegic and Vermillion mining companies producing Bessemer ores can be perpetuated is mere speculation, up to this point. There are factors in the situation pointing to an affirmative answer; some opposite considerations appear. The agreement of the past year has been popular with furnacemen, in the guarantee of uniform prices it has given. It has made no great money for the mining companies, but it has kept a bad situation from being worse. There are conflicting views of the outcome of the present conference. One element, at least, will prove less troublesome than in other years. The enormous consumption of Lake Superior ores should cause little friction over the allotment limitations. The present meeting being preliminary, and some prominent members being absent, an adjournment will be taken.

Pig Iron. A firmer feeling in foundry iron and a quiet market in Bessemer are noted among local pig iron houses. Quotations at valley furnaces continue at $9.50 for No. 2 foundry and $10 for No. 1 and some sales of small lots have been made. The output of valley furnaces producing Bessemer iron has been fairly well sold for the first quarter of 1898, and while $9.50 at furnace was the price of most of this metal, that figure is refused by furnacemen on second quarter business. In the past week the market has been at a standstill. There is some inquiry for Southern foundry and forge irons, with the latter quoted 25 to 40 cents above Northern forge, delivered at valley mill. We quote:

Bessemer	10 15	Valley Scotch No. 1	$10 65@10 75
No. 1 Strong Foundry	10 50@10 75	Valley Scotch No. 2	10 25@10 40
No. 2 Strong Foundry	10 15@10 25	Gray Forge	9 00
No. 3 Foundry	9 25	Lake Superior Charcoal	12 00

Finished Material. Heavy rail buying by the Lake Shore and related lines is the principal local tonnage in rolled products. There is some inquiry by agricultural works and orders are expected to be placed early in January. The building outlook for next spring is good locally, but immediate tonnage is small. Steel bars have sold at 1c delivered in Cleveland, which would make the Pittsburg equivalent about 50c a ton below the 95c basis. Tank plates continue at 1c, Pittsburg, and beams and channels at 1.10c.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Dec. 29.

Christmas week has not shown a very active market so far as actual buying is concerned, but the number of inquiries received has increased considerably, pointing to the probability of a large tonnage in January. In all branches of the iron and steel trade consumers have been feeling the market for the past several weeks, and dealers expect that the result of the inquiries will be a very heavy buying movement shortly after the first of the year. The local mills are well fixed as to orders for the first half of the new year, and are exceedingly independent. President Gates, of the Illinois Steel Co., in a recent interview stated that his company has business on hand and in sight for 800,000 tons of steel of various kinds, practically filling its order book for more than half the year. The company is in better shape financially than it has been for a long time past, and it is fully expected that 1898 will be the best year that it has ever seen. A goodly proportion of the orders of the company are for rails, its sales to the railroads in the past two months having been very heavy. Prices on much of its output are higher by from $1.50 to $2 a ton than they were 30 days ago, and the tendency is upward.

PIG IRON.—Sales of Southern iron last week were considerably in excess of those of the week before, and are large for this season of the year. The local furnaces are also selling a fair quantity of iron, and express themselves as very well satisfied with the trade coming to them, considering the season. The number and size of inquiries is increasing, denoting a good business for next month, although it is hardly expected to come in much before the middle of the month. Prices are very firm, particularly for Northern irons, and have not been changed. Some of the smaller Southern furnaces have been making reduced prices in this market in the past two weeks, and this has given the impression that the general market is weaker, causing some consumers to postpone buying for a time. As a rule, the larger Southern furnaces are not making concessions, believing that after the first of the year they will not be necessary to secure trade. We quote:

Lake Sup. Charcoal	$12 50@13 00	South'n Coke No. 3	$10 35@10 60
Local Coke Fdy. No. 1	11 00@11 50	Southern No. 1 Soft	10 85@11 25
Local Coke Fdy. No. 2	10 50@11 00	Southern No. 2 Soft	10 60@10 85
Local Coke Fdy. No. 3	10 25@10 50	South'n Silveries	11 25@11 50
Local Scotch Fdy. No. 1	11 50@12 00	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	11 00@11 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 50@11 00	Alabama Car Wheel	16 00@17 00
South'n Coke No. 1	11 00@11 25	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	10 60@10 85	Coke Bessemer	11 50@12 00

BARS.—A fairly good tonnage was secured by the mills last week, including several orders of quite large size. Car builders continue to be large buyers of bars, and the inquiries now in hand denote a continuance of this class of trade. Prices are quite firm, and are still made at 1.05c to 1.10c for common iron, 1.15c to 1.20c for guaranteed, and 1.15c to 1.20c for soft steel bars from strictly billet stock.

CAR ORDERS.—No especially large orders were placed last week, but a number of small orders have been given out, and the inquiries coming in all the time promise a good business in the future.

RAILS AND TRACK SUPPLIES.—The local mills have taken large orders forrails in the past few weeks, and are now well filled for the first half of the year. The belief is current, among those best posted in the trade, that rail orders for 1898 will be considerably in excess of those for 1897. The market is firm, and prices are being maintained by all the mills. Prices are as follows: Rails, $20 to $22.50, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—Some business has been done in this territory by outside mills, but the local makers are well filled with orders, and are selling only in small lots to fill in. Quotations are unchanged at $17 for billets and $23 50 for rods.

STRUCTURAL MATERIAL.—The contract for the Drainage Canal bridges has not yet been let, but probably will be this week. No large contracts were given out last week, and no new ones came up to be bid upon. General business in small lots, considering the season, has been very good. The market is very firm and quotations are firmly maintained. Prices are as follows: Beams, 15-inch and under, 1.25c to 1.35c; 18, 20 and 24-inch, 1.35c to 1.45c; angles, 1.20c to 1.25c; plates, 1.15c to 1.20c; tees, 1.30c to 1.40c. Small lots from stock are quoted at one-quarter to one-half cent higher.

PLATES.—No large sales were made last week, but a good tonnage of small orders was closed, and the demand keeps up very well. Quotations are made as follows: Tank steel, 1.15c to 1.20c; flange steel, 1.40c to 1.45c; firebox steel, 1.85c to 5c.

SHEETS.—Several good orders have been closed up in the week, and the inquiries in hand denote a continuance of the business. Small orders for delivery from store are frequent, and make a good total of business. Quotations are made at 2.20c to 2.25c for No. 27 black and 80 and 7½ per cent discount for galvanized.

MERCHANT STEEL.—Business continues to be very good, particularly in small orders from store, of which a good tonnage was closed last week. The market is very firm. Prices follow: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.45c to 1.50c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—There is not much doing in this branch of the market, and dealers are not looking for a decided increase in orders before the middle of next month. Dealers' selling prices are as follows:

Old iron rails, gross	$12 00@$12 50	Axles, net	$14 00@$14 25
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 00@ 4 25
Old steel rails, short	9 00@ 9 25	Wrought turnings, net	5 50@ 6 00
Old wheels, gross	10 50@ 11 25	Axle turnings, net	7 25@ 7 50
Railroad forge, net	11 75@ 12 00	Mixed steel, gross	..... 7 00
Dealer's forge, net	9 00@ 9 50	Stove plates, net	6 00@ 6 25
No. 1 mill, net	8 00@ 8 50	Heavy melting steel gr.	8 00@ 8 25
Heavy cast, net	7 75@ 8 25	Old iron splice b., net	13 25@ 13 75
Malleable cast, net	8 00@ 8 50		

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Dec. 29.

Work for next year continues to appear in primary stages and reports agree in estimating the present inquiry as the heaviest in many months. Structural work in the inquiry stage is unusually heavy, while present business does not keep the mills in operation. The Manhattan Viaduct work in New York comes to Pittsburg for plain material. Rail business is steady and large and $18 mill is firmly held. The new wage scale of the Carnegie Steel Co., Ltd., is announced and is virtually a continuation of the present one.

PIG IRON.—Bessemer pig is ruling at about $9.50, valley and $10 to $10.15, Pittsburg with little interest apparent. Iron that might have caused a depression if brought forward has been cared for mainly through conversion deals—and the present market is steady although very quiet. The very low sales of gray forge have ceased and prices are somewhat stiffer. Pittsburg sellers are relatively weaker than those in the valley, but nothing less than $9 is quoted. Foundry buying has been light. Connellsville coke is selling at $1.65. Quotations are made as follows:

Bessemer, valley	$ 9.50
Bessemer delivered Pittsburg District	10.00 to 10.15
No. 1 Foundry	10.75 to 10.90
No. 2 Foundry	10.25 to 10.40
No. 3 Foundry	10.00
Gray Forge	9 00

BILLETS.—The large buying of two weeks ago has again filled up the books of steel mills. Business since has been steady but in small lots. It is now stated at Shenango and Mahoning valley mills, as well as at the Pittsburg mills, that books are in good shape for the first quarter. On the other hand, Wheeling district mills are said to be running very close to specifications. A sale of 2,000 tons of billets is reported, at $15.25, Pittsburg mill, but quotations of $15 have been made. The market is quoted at $15 to $15.25 maker's mill. Sheet bars are very firm at $17 to $17.25.

PLATES.—The December tonnage of plates will probably be heavier than that of November although not as large as the October tonnage. Inquiries for next year are coming in at a rate unheard of at this season of the year. Mills are quoting: Bessemer and open-hearth tank, 1c; shell, 1.10c; and flange, 1.20c.

STRUCTURAL MATERIAL.—For the time being, structural business is very small and one local mill is idle for lack of orders. On the other hand inquiry for structural shapes of all kinds—generally light at this season—is heavier than for many months, the active season in the fall not excepted. Locally bids have been asked for on an addition to the Penn-

sylvania Tube Works, that will use upwards of 1,000 tons of angles, sheets, and beams. Beams, up to 15 inches, are firm at 1.10c pending a meeting at the Holland House, New York, on Tuesday, of the six beam manufacturers whom it is planned to include in a revived beam pool. The plan as talked of is a matter of apportioning outputs rather than any attempt to maintain prices above that ruling to-day. An advance over 1.10c on beams is thought here to be improbable. Universal plates are quoted at 1.05c; tees and zees, 1.20c; angles, 1.10c. The contract for plain material for the new Manhattan Viaduct, New York, was awarded on Tuesday, to the Carnegie Steel Co., Ltd. The work calls for 6,000 tons. Material for another similar viaduct in New York is now at the bidding stage.

SHEETS.—The meeting of the Sheet Manufacturers' Association last week fixed no scale of prices further than the present nominal base of 2.05c for No. 28. There is no difficulty in getting the 2.05c for No 28, at present and 2.10c has been done on small business. Inquiry is increasingly heavy for next year, without any pressure to sell. Eastern inquiries continue heavy. For galvanized sheet quotations are made at 80 and 5 per cent off list.

IRON AND STEEL SKELP.—Skelp mills generally are closed undergoing repairs and business is light. Grooved steel skelp, .95c to .97½c; sheared steel skelp, 1.02½c to 1.05c; grooved iron skelp, 1.10c to 1.12½c; sheared iron skelp, 1.17½c to 1.20c.

OLD MATERIAL.—The selling movement in billets and sheet bars has stiffened asking prices for all kinds of scrap and further increased the gap between asking and offered prices. Old steel rails are quoted at $11 and sales are reported at $10, gross; No. 1 wrought has sold at $11 net, cast scrap at $9.25, gross; and car wheels at $10.50, gross.

BARS.—Bar mills are getting close to order books again and the quotations of .95c on steel bars has been resumed in some quarters. The larger mills still quote 1c but prices lower than this have been made in the week. Below .95c no sales can be authenticated. Inquiry for steel bars is heavy, notably from the East, and business is in sight that will occupy the mills to their utmost. One large Eastern contract is now pending. In bar iron there is a scramble for business both by valley and Pittsburg mills. On common, .95c is quoted and on branded all-muck 1.25c to 1.30c.

RAILROAD AND TRACK MATERIAL.—Rail business now pending in very heavy. The Lake Shore & Michigan Southern Ry. has bought a good tonnage to be rolled at Edgar Thomson, deliveries running during the year. Both Eastern and Western roads are negotiating but so far there has been no clash over prices and the market is firm at $18, Bessemer. Demand for light sections and relaying stock is not so large. The girder mill at Homestead is about ready for rolling. On track material we quote: Iron track bolts, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c; splice bars, 1.10c to 1.15c; links and pins, 1.15c to 1.20c.

SPELTER.—Spelter has quieted and sales are reported $3.85 and $3.90.

FERRO MANGANESE.—For 80 per cent domestic ferro-manganese, $47 and $47.50 is quoted.

PIPES AND TUBES.—Demand for all sorts of pipe was unusually heavy for a holiday week. Merchant pipe continues the weak feature and oil country goods are as noticeably active. On merchant pipe the association discounts quoted below are now subject to a further discount of from 5 to 10 per cent. Butt weld black, 72 per cent off; lap weld black, 78 per cent off; butt weld galvanized, 67 per cent off; lap weld galvanized, 70 per cent off. The second discount is 10 per cent on car load lots. Discounts on merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½-inch and larger, 75 per cent off.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The holiday season instead of hurting business seems rather to have had a stimulating effect upon it. Inquiries have been coming in at a good rate for the past ten days and the volume of sales is steadily increasing. There are but few large orders, the tonnage being mainly made up of car load and small lots, say not to exceed 100 tons. At the present time a number of large buyers are in the market evidently trying to hammer prices down, but the Birmingham iron masters have been holding firm at the concession they made early in the month; that is, $6.50 for gray forge, and $7.25 for No. 2 foundry are the minimum furnace prices. There is a growing feeling that there will be a smart buying movement early in the year, and it is probably this that is sending buyers into the market now, the idea with many being that if they come in now at a comparatively quiet time they will do better than when the market is more active. It is believed that consumption and production are now on about an equal footing and no material change in stocks is expected on Jan. 1. We drop quotations on certain grades of iron to correspond more closely with views of some of the furnaces most anxious to sell: Southern coke No. 1 foundry, $9.75 to $10; No. 2, foundry, $9.50 to $9.75; No. 3, foundry, $9.25 to $9.45; gray forge, $9; mottled, $8.75 to $9.50; No. 1 soft, $9.75 to $10; No. 2 soft, 9.50 to $9.75; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson county silvery, No. 1, $12.50 to $13; Standard Georgia car wheel, $14.25 to $15.

Buffalo. The opinion is quite general that there will be a strong buying movement throughout the country beginning soon after Jan. 1. This district expects to participate in the movement. Buyers who predicted large stocks and falling prices at the end of this year are surprised at the decrease in stocks, which continues to accompany the heavy production. Furnaces in this district are still busy shipping on orders already entered. New orders are quite numerous, though generally for small amounts. One producer reports more business taken for December this year than in any December for five years back. We quote below on the cash basis f. o. b. cars Buffalo: No. 1 strong foundry, $11.25; No. 2 strong foundry, $10.75; Ohio strong softener, No. 1, $11.75; No. 2, $11.25; Jackson county silvery, No. 1, $14; Southern soft, No. 1, $11.75; No. 2, $11.35.

THE TIN PLATE MARKET.

The interest in the market shown by larger buyers, as mentioned last week, has continued and to a certain extent increased. As a result some business has been closed, but prices have been rather in buyer's favor and there is a weakening in the market as compared with the early part of the month, from 2½ to 5 cents per box. It is not generally conceded that prices are any lower, but the occasional sale by some mill anxious to fill its order book shows that the tendency is toward lower rather than higher values.

The inquiry through the East is considerably heavier than in the West, but the large number of plates to be disposed of in the East by the mills and dealers has the effect of keeping prices down to the bottom notch. It is reported that some large contracts have been closed in the week.

It is understood that a meeting of the Tin Plate Manufacturers' Association will be held in Columbus on Wednesday the 29th, but no combination or trade agreement is under consideration. After the unsatisfactory working of the gentlemen's agreement last year it is not probable that the smaller mills will go into a similar arrangement this year. Little was accomplished in the former association, and the result, as far as many of the mills was concerned, was very unsatisfactory, so it was claimed, bad faith being charged against several of the larger mills. The average quotation of the market f. o. b. Pittsburg, and Indiana district is as follows:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$3.45	$4.20
Calland Grade,	3.65	4.35

COKE TINS.

IC, 108 lb.	Basis weight,	$2.95
100 lb.	" "	2.85
95 lb.	" "	2.80
90 lb.	" "	2.75
85 lb.	" "	2.70
80 lb.	" "	2.65

TERNE PLATES.

IC, 216 lb., 20 x 28		$5.95
200 lb.	"	5.65

THE offices of the Inland Steel Co., heretofore at the works of the company, at Chicago Heights, Ill., have been removed to 1227-1229 Marquette Bldg., Chicago.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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DECEMBER 30, 1897.

A BRIGHT OUTLOOK.

The iron trade faces the new year with far greater confidence than it had in looking forward to 1897 from the closing days of 1896. Then all was uncertainty. The billet and wire nail pools had gone into wreckage in early December; the Merchant Bar Iron Association had little more than a nominal existence; the leading factors in the rail agreement gave some premonition of the desperate struggle that came a few weeks later; the acquisition of mines by the Carnegie Steel Co. cast a shadow of apprehension over all the plans of less favored producers; the revival expected from the November election result, and in anticipation of the actual change in administration in March, had not come; railroads were holding back and the prospect for rail tonnage in the new year was anything but encouraging. To-day, not only is the feeling everywhere prevalent that the iron and steel trade has passed through the worst that any combination of calamitous causes could bring upon it, but that it is entering upon a period of unparalleled consumption, with conditions in other industires such as to contribute steadily to its prosperity. The pool wreckage of 1896 and 1897 is out of the way; values are on so low a level that the tendency will be up rather than down; and at the same time the fact that so enormous a consumption as has been seen in the past few months has made so little change in prices, is indicative of the evenness of values that may be looked for in the months just ahead. That a year opening so inauspiciously, closes with so much that is encouraging, so far as volume is concerned, is certainly stimulating to optimism; and faith in the future should not be difficult when so much that is so substantial appeals to sight.

In the paper of Mr. H. J. Lewis, read before the Western Pennsylvania Mining Institute last week and printed elsewhere in this issue, is a suggestion that bears in an important way upon the future of the railroads engaged in the ore and fuel traffic between Lake Erie and the furnace districts of the valleys, Wheeling and Pittsburg. There is at present an excess of the ore movement from lake ports over the return movement of fuel; particularly in the intervals of navigation seasons is the cost of operation enhanced by the lack of return loads. The railroads have tried to secure the largest economy out of the present situation by working for a maximum ore tonnage in navigation time, to balance the heavy movement of coal to the lake, and in the winter to have as little ore as possible to move in cars that must go back empty. The rebate on ore loaded directly into cars from vessels works to the above end, leading furnace companies to provide greater stockpile room so as to carry a good portion of their winter's supply. With the great increase in the total ore movement, due to new furnaces in the Pittsburg district and the much larger outputs of all stacks, there is such a demand for cars in summer and fall, under this arrangement, that much friction is experienced, this being particularly embarrassing to shippers in the past season. By-product coke ovens connected with blast furnace plants along the lake shore would help to distribute the tonnage, through the year; another aid to its solution would be such facilities for water transport of finished steel from Lake Erie ports to the East, as would bring a considerable tonnage from Pittsburg and valley mills to Lake Erie ports. But neither of these developments can be counted on for the immediate future. When our pig iron consumption is 15,000,000 tons annually, it may be expected that the south shore of Lake Erie will be contributing a liberal percentage of the output; and against that day the problem of better water outlet to the East will be nearer solution than it is to-day.

Another meeting of bridge manufacturers has been held, with its usual discussions of territorial arrangements for the coming year, to the end that profitless competition over small county contracts may be prevented. As on other occasions of conference on these matters, the report that a gigantic consolidation was under consideration has been set afloat, with the familiar attachment that plans are under way for the erection of a mammoth steel plant and structural works. Meetings of competing manufacturers are not so infrequent, nor so threatening to the public welfare as to require to be covered up with such flimsy fabric. When there are no structural mills to supply their wants, we may expect to see the bridge works pooling their profits to go into steel manufacture; meantime they will continue to confine their stated conferences to questions more apt to involve the making of a profit.

The iron and steel export figures continue to show a gratifying growth. Ten months of 1897 are covered by official statements, and for that period the outward movement of pig iron was almost 200,000 tons. In the table below the October exports are given, for 1897 and 1896, also those for the 10-months period ending with October in each year. It will be seen that almost 3¼ times the

tonnage of October, 1896, was shipped abroad in that month of this year and that the totals for the 10-months periods are in almost the same proportion:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	October.		Jan.—Oct.	
	1896.	1897.	1896.	1897.
Pig iron { ferro }	8,063	{ 824	34,981	{ 3,881
Pig iron { all other }		{ 26,693		{ 194,734
Scrap	355	2,236	1,203	34,929
Bar iron	139	356	3,048	3,744
Steel bars (not wire rods.)	1,977	792	6,732	37,415
Iron rails	2	58	563	5,073
Steel rails	4,692	20,243	55,533	108,816
Billets, ingots and blooms	(b)	338	(b)	3,681
Hoop, band and scroll iron	90	423	251	994
Wire rods	(b)	1,852	(b)	8,163
Iron sheets and plates	54	346	574	3,230
Steel sheets and plates	81	1,908	691	4,083
Structural material	(b)	3,668	(b)	10,373
Wire	3,943	4,928	29,651	44,016
Cut nails	1,206	985	9,392	13,165
Wire nails,		{ 565		{ 3,740
Other, including tacks }	337	{ 157	3,295	{ 2,908
	20,939	66,373	145,844	482,945

(b) Not separately stated prior to July, 1897.

The value of all the iron and steel exports, including machinery, for the 10 months ending Oct. 31, 1897, was $51,358,320, against $38,957,645 for the first 10 months of 1896. In addition to this, other export values, involving considerable in iron and steel, were $2,707,652 worth of carriages and cars; $6,139,795 worth of cycles and cycle parts (against $3,080,154 worth in January-October, 1896); $5,002,281 worth of agricultural implements.

Railroad building in 1897, according to the record made up by the *Railway Age*, shows only the faintest indication of improvement over 1896. The better business condition and the increased railroad earnings of 1897 did not come early enough in the year to give construction work much of an impetus. Quite a little is now under way, but the track actually laid is given as but 1,864 miles, as compared with 1,848 miles in 1896, 1,083 miles in 1895, 1,949 miles in 1894 and 2,635 miles in 1893. Thus for four years new railway building has been at an exceedingly low ebb, and it is because the new mileage of the five years preceding 1893 ranged well up—4,192 miles in 1892 being the minimum and 7,106 being the maximum for that period—that the average for the past decade is brought up to 3,520 miles. The year just preceding this decade, 1887, was the greatest in our history, its total being 12,983 miles. In the past year Alabama laid 111 miles of new track; Arkansas, 109½; California, 210; Georgia, 119; Louisiana, 145; Michigan, 133; Missouri, 110½; Pennsylvania, 116½; Texas, 103½; Wisconsin, 115½. None of the other States reached 100 miles. Reports show that on 20 lines over 400 miles of track-laying is in progress or beginning, and much of it will be finished before the end of March. It is to be expected that the improvement in railroad finances will show itself in a more encouraging construction record in 1898.

Personal.

H. C. Frick, chairman, has made formal announcement of the appointment of Homer J. Lindsay, heretofore special agent of the Carnegie Steel Co., Ltd., to be assistant to the president, the change being effective Dec. 14.

H. K. Porter, the Pittsburg locomotive manufacturer, has returned from a trip to Europe.

Raoul Baguenault de Puchesse, representing French iron and steel factors, with a branch house in South America, is making a tour of the United States, partly with a view to making export arrangements with manufacturers in this country.

Chas. de Wendel, representing one of the most extensive of French iron and steel establishments, that of Les Petits Fils de Francois de Wendel et Cie, is visiting the steel manufacturing centers of the United States. The plants of the company are located in part in the department of Meurthe et Moselle and in part in Lorraine. The company operates 18 blast furnaces which average 100 tons a day, running on 30 per cent ores from the company's own mines, and Westphalian coke. Ore and coal mines and the blast furnace and steel plants employ a total of 12,000 men. The finished product is largely structural material, rails, bars, plates, sheets and wire. Some iron is puddled, but the bulk of the product is basic Bessemer steel. M. de Wendel has been in Cleveland and Lorain the past week. Chicago will be visited next and then in turn Pittsburg, Johnstown, Steelton, Bethlehem and Sparrow's Point.

Carnegie Steel Co. Wage Scale for 1898.

The wage contract in force at the several plants of the Carnegie Steel Co., will terminate by agreement Friday. The present contract, which has been in effect since 1895, will be renewed with all employes except the tonnage hands The bonus payments of 10 per cent which the company has made since June, 1895, in addition to the contract rates, will be continued to all employes, including tonnage, turn and day men upon the same condition as heretofore. New contracts are now being signed between the company and the tonnage men, as the improvements made in the mill equipments during the year have increased production by a large percentage and changed the system of operation to a great extent.

The Pittsburg Malleable Iron Co. has received orders recently from Sheffield, and London, Eng., for 24 tons of malleable iron castings. The order to Sheffield is for 13 tons and consists of about 8,000 pieces. They will be used for street railways and sub-ways under construction there. That for London is in two orders, aggregating 11 tons, and consists of machinery castings.

An order for one of the largest traveling cranes ever built was placed with the Riter-Conley Co., of Pittsburg this week. It is to be constructed at the Union Dry Dock, at Buffalo. Plans for the crane were specially made by the Wellman-Seaver Engineering Co., of Cleveland, and the one to be built by the Riter-Conley Co. is the first to be constructed on the latest lines. The runway is to be 500 feet long, and the crane is to have an overhang of 175 feet. The contract is to be completed in 90 days.

The National Tube Works Co. has declared its regular quarterly dividend of 1¾ per cent payable forthwith.

The Highland Bridge Co., of Pittsburg, has been chartered to build a bridge across the Allegheny River.

It is announced that citizens of Greenville, Pa., have purchased the required amount of bonds, $15,000, for the starting of the Kimberly mills, as noted in another column, and preparations to resume will be made at once.

The Thompson Mfg. Co., Cleveland, whose roofing plant burned two or three months ago, is erecting a new building at a cost of $6,000.

It is reported that Russell & Co., of Massillon, O., have issued shop orders for the construction of farm machinery, that will involve an expenditure of $1,000,000 for material and labor. The present force will be doubled eventually, the increase being made gradually and the maximum force will be on by Jan. 31. At that time machines will be turned out at the rate of 100 separators and 70 engines. The automatic engine trade has increased notably.

At a meeting last week of the stockholders of the Shenango Valley Steel Co., the capital stock was increased to $2,500,000.

MACHINE FOR BREAKING PIG IRON.

In the paper of Mr. Axel Sahlin, entitled "The Handling of Material at the Blast Furnace," prepared for the Chicago meeting of the American Institute of Mining Engineers, and reproduced in these columns, a description was given of the machine for breaking pig iron, in use at the Dowlais Works, in Cardiff, Wales. There are some instances in the United

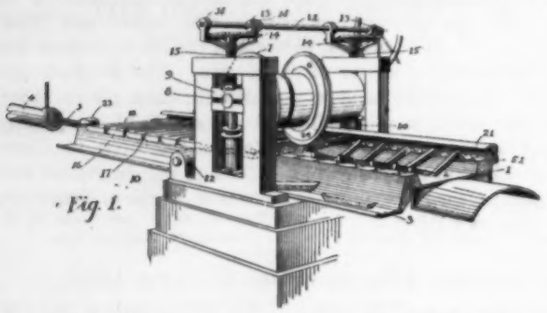

Fig. 1.

States of the employment of machines for breaking sows or straight bars, but there has been some question as to their entire success. A patent has been granted recently to Mr. Sahlin, on a machine for breaking and loading pig iron, and its principle and operation are indicated in the accompanying cuts. The patent covers the principle of a reciprocating motion between a supporting table and a breaking roll. As long as there is the practice of grading foundry iron by fracture, there will be sand-cast pig iron, and after slow cooling the breaking operation, which will be done by machinery where the largest economy is sought.

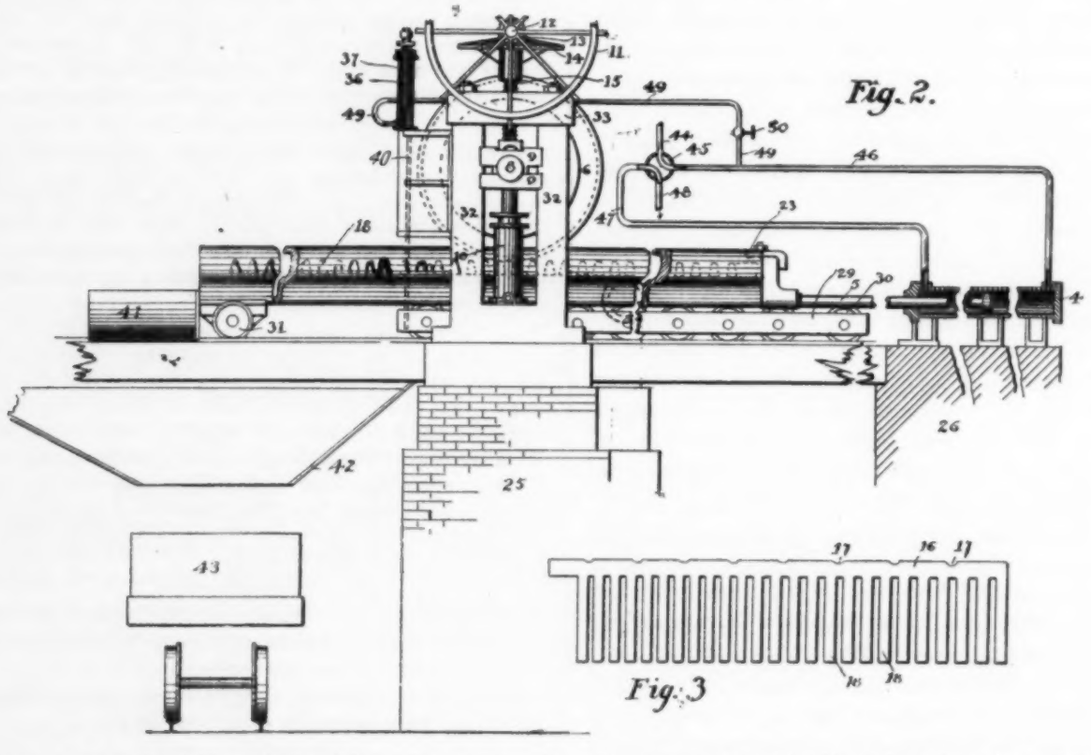

Fig. 2.

Fig. 3

The pig-breaking apparatus now in use, which have operated satisfactorily, have employed direct-acting breaking hammers. By Mr. Sahlin's method the whole sow with the pigs attached is taken from the sand by a traveling crane, and placed upon a support forming part of the apparatus. On this machine, movable relative to the support, are provided one or more cam wheels or rollers, so placed that when each pig is brought under the roller it will be broken from the sow and also broken at or near the middle. There is also a roller which breaks the sow into lengths. A scraper automatically loads the broken pigs into cars.

Fig. 1 is of reduced size relative to Fig. 2. It is a perspective view of the machine, while Fig. 2 is an end elevation, with the cylinders in section. Fig. 3 is a plan of the sow, with pigs attached, as it is taken from the sand. In Fig. 1, 1 is a movable support or platform, having a depression 2 to receive the broken pigs and a depression 3 to receive the sow. It will be seen that the carriage is so shaped that the pigs are supported at the ends only. This carriage is moved in the direction of its length by the hydraulic cylinder 4 and the piston-rod 5. Upon the carriage is placed the pig-bed, as shown. 6, 7 are two circular cams or rollers supported on the shaft 8 in suitable bearings 9, supported in turn by the hydraulic cylinders 10 10 or otherwise. The hand-wheel 11, working through shaft 12, bevel-gears 13 13 and 14 14, and screws 15 15, serves to adjust the height of the rollers to allow for any irregularities on the pig-bed.

If now the carriage be run back and the pig-bed be placed in position, and the carriage be then advanced, the roller 6 will bear upon the pigs successively, and break them one by one at the center. As the sow is held down by the roller 7 the pigs will be broken off from the sow at the same time at the notches. As the diameter of the roller 6 is preferably large as compared with the depression of its lower edge below the top of the pig-bed, the leverage secured is enormous, while the slow rotation of the roller in its bearings 9 or upon the shaft, as may be preferred, prevents friction. The breaking action is therefore even and uniform, without serious shocks or jars, and when the carriage reaches the end of its travel the pigs lie in the depression, 2, broken and ready for loading. It will be seen that the breaking mechanism is automatically actuated by the relative motion between it and the pigs. The carriage preferably has an overlapping edge or flange 21, under which the ends of the pigs extend, which prevents the broken pieces from flying up and doing damage.

The pigs are forced against the edge of the roller and that they exert a horizontal, nearly tangential, pressure upon the roller. The reaction of the roller against this pressure is radial and may be resolved into two components, one of which is opposite to the pressure and one of which is downward or at right angles to the pressure. This second component, which acts to break the metal, is very large in proportion to the horizontal pressure, and the breaking action is very powerful and even, while only a comparatively small force need be exerted by the cylinder 4.

The sow is broken by the action of the small roller 22 in conjunction with the roller 7. The back end of the sow is held down by its own weight and also preferably by the flange 23. The roller 22 thus forms a fulcrum, and the roller 7 is so adjusted that it tends to force the sow downward. At a certain point the pressure will become so great that the sow will break at its weakest point, one of the notches, and fall onto the depression of the carriage. Therefore at each reciprocation of the carriage it is possible automatically to

break up the whole pig-bed into lengths suitable for shipping without the use of hammers and without exposing the machinery to dangerous shocks. By providing the roller 6 with a flange, 24, if a pig happens to break first in the middle it will be held down and broken off from the sow by the flange acting in conjunction with the roller 7. While the roller forms an almost frictionless device, its purpose so far as the breaking of the pigs is concerned is simply that of a clamp holding the sow down while the pigs are being broken from it.

British and American Manufacturing Contrasts.

The American who makes money uses his surplus capital to increase his output in order that, by manufacturing on the largest scale, he may decrease the cost per unit of product, while the Briton uses his surplus capital to buy lands and houses or to make secure investments by which he can leave his children independent of the fluctuations of his business. The American, in his fierce competition with his neighbors to command a market, tears down his plant at the end of a few years if he finds that he can substitute a new and improved one which will enable him to make his product more economically, while the Briton is disposed to let well enough alone. In America capital flows toward the successful man and he avails himself of it; in Great Britain a man similarly situated is apt to consider that handling the capital of others is an added burden to life without any compensating advantages except the chance of making more money, of which he has already enough. The character of the American kings of industry has been formed by the vastness of his country, its marvelous opportunities for development, its incomparable material progress in so short a span of time, its isolation from competitors, and, above all, its unbroken record of increasing wealth. For men trained under such auspices no task is too difficult, no risk is too great, no amalgamation of interests is too large; while the British kings of industry, "cabined, cribbed, confined," on a small island, opposed on every side by hostile tariffs, hampered by the conditions of former successes achieved through caution, accustomed to work on the orders of middlemen instead of seeking markets direct, in their turn have been molded so that they have come to prefer security to enterprise, steady returns to enormous risks, personal supervision to corporate management of combined interests on a vast scale. Such is the contrast, though it is not altogether as one-sided as it seems. If the American watchword is "audacity," the British watchword is "stability." If the American is dependent on prosperous times to make a fortune, the Briton is equal to meeting prolonged bad times without losing one. The product of the velocity of the one and the mass of the other would be a momentum strong enough to transform the world.—[Cassier's Magazine for January.

Important Bridge Work in New York.

The Manhattan Viaduct in New York, the material for which was awarded to the Carnegie Steel Co., Ltd., on Tuesday, is one of the heavy contracts for the year. The viaduct is an extension of the Riverside drive across Manhattan Valley to 134th street. The structure will be 1,564 feet long and 60 feet wide. The approaches will be 480 feet long, making the total bridge length 2,044 feet. The roadway will be 95 feet above the water at 127th street and 75 feet above the water at 135th street. About 6,000 tons of bridge material will be used. The Board of Estimate and Apportionment has also received bids on a viaduct over the Harlem Railroad tracks at 153d street. This bridge will be of similar design, 520 feet long, 50 feet wide and estimated to cost $150,000. About 4,500 tons of bridge material will be needed.

AT Bellefonte, Pa., three weeks ago, 60 employes of the Valentine Iron Co. brought suit to recover wages due them. They got judgments and had issued an execution for the sale of the personal property of the company. Last week counsel for the company secured an injunction restraining the constable from making the sale. The writ is returnable Jan. 5. The amount of unpaid labor claims is about $5,000. In addition to this Robert Valentine, treasurer and secretary of the company, holds a judgment for $90,000, while there are a number of other outstanding accounts and a mortgage for $75,000 against the plant.

PUBLICATIONS RECEIVED.

The Bethlehem Iron Co., in its latest folder, calling special attention to its forgings of open-hearth steel—fluid compressed, hydraulic forged, annealed or oil-tempered, rough machined or finished, gives weights of round steel per running inch. The table contains the weight per inch for each $\frac{1}{16}$ inch variation in diameter between $\frac{1}{4}$ inch and 36 inches. A steel round $\frac{1}{4}$ inch in diameter weighs .01 lb. per running inch; steel 36 inches in diameter weighs 289.08 lbs. per running inch.

A recent work of the Bureau of American Republics is a dictionary of trade nomenclature, which contains all the words in the Latin tongues that stand for articles of commerce and manufacture. It requires three mammoth quartos to contain the 28,000 commercial terms used in the Latin-American trade, the English, Spanish and Portuguese equivalents being given. It is predicted that this dictionary will be accepted eventually as the authority of the world as to the meaning of Latin-American technical terms.

The last illustrated card of the Stiles & Fladd Press Co., Watertown, N. Y., bears the announcement that after Jan. 1, 1898, the name of the company will be changed to the E. S. Stiles Press Co.

"An Every-Day Coal Washer," is a recent pamphlet of the Jeffrey Mfg. Co., Columbus, O., in which the claims for the Jeffrey-Robinson coal washing system—simplicity, efficiency, low cost of installation and low cost of operation—are detailed. The system can be applied to any coal tipple. The cost of operation is said to be, in some places, as low as one cent a ton.

The General Electric Co., in a 12-page pamphlet describes the class of lamps which it offers for electric railway service exclusively. The new exhaustion process is emphasized as a special feature in the manufacture of these lamps.

No. 12 of the Bulletin of the University of Wisconsin is taken up with a thesis submitted by Geo. Henry Trautmann, for the degree of bachelor of sciences, under the title "A Comparative Test of Steam Injectors.' Nine injectors are considered from the point of view of efficiency as boiler feeders. In an introductory note Prof. Storm Bull says that from the results of the tests as published in this bulletin it should not be difficult for any competent person to select the best injector for boiler feeding, among the nine tested; and further, from the similarity of nearly all other injectors to some one among the nine, the tests should be of much assistance in deciding which injector is best adapted to a particular situation. The injectors tested are the Korting, the Sellers, the Sherwood, the World, the Metropolitan, the Monitor, the Penberthy, the Excelsior, the United States.

H. S. Vrooman, dealer in fire brick, fire clay, molding sand and core sand, 220 W. 20th st., Chicago, is sending to Western foundrymen a substantially bound book 7x8½ inches, containing many pages of blanks for mixture and cupola reports. Spaces are provided for records of iron and fuel charges, time of lighting, time of turning on blast, amount of blast pressure, time of dropping bottom; the various brands of iron charged, with weights, and the results of tests. The forms will prove of value to foundrymen who have not been accustomed to bringing into compact space these important records.

The Washington Coal & Coke Co., Dawson, Pa., with sales office at 23 Conestoga Bldg., Pittsburg, N. P. Hyndman, agent, in its diary and memorandum souvenir for 1898 gives a history of its mines and coke plant, with much general information concerning coal and coke and other industrial developments in Fayette Co., Pa. The company now has 3,500 acres of coal nine feet thick and its three mines have a capacity of 3,500 tons a day. From 3,750 tons of coal shipped in 1893, the coal and coke shipments of 1896 were 353,000 tons, and for the nine months ending Sept. 30, 1897, they were 603,600 tons.

THE Globe Iron Works Co., of Cleveland, has purchased a majority of the stock of the Shipowners' Dry Dock Co., of Cleveland. The Dry Dock Company owns two docks, one 450 feet long on the blocks, with 15 feet of water on the sills, the other 325 feet long, with 14 feet of water. The Globe Iron Works Co. announced some time ago that it purposed building a floating dry dock; but this extension will not be made now.

LAKE SUPERIOR IRON MINES.

On its face the Duluth report that the Carnegie-Oliver interests have closed for a mine on the Vermillion range, near the Chandler and Pioneer, and owned by John G Brown and A. M. Miller, seemed improbable, since it is not the policy of the Oliver Mining Co. to acquire unopened properties, which would require a large expenditure before any ore could be taken out. Moreover the report is denied on good authority. The Duluth despatch stated that the lease is for 20 years, with a royalty of 30 cents a ton, a bonus of $30,000 and a minimum output of 100,000 tons. It was also stated that the Minnesota Iron Co. leased the mine four years ago, and after spending $20,000 on it, gave up the lease, but that the owners sunk a shaft 400 feet last year and that a drift had passed through 100 feet of ore.

The Queen mine at Negaunee closed down Dec. 27, 250 men being thrown out. The royalty is 25 cents a ton. The mining company will resume in case a proper reduction can be secured.

After the union miners at Ishpeming, Mich., had rebuked the meddlesome policy of their officers by refusing to strike in the face of the assurance that a proper wage adjustment would be made for the next season, the mining companies announced this week the new schedule of wages. The increase averages 10 per cent and will date from Dec. 1. The pay of common labor is put at $1.35 and the average daily wage of miners upwards of $2. It is believed that since the futility of the union and the incompetence of its leaders have been demonstrated, what there was of the organization will now be abandoned.

The management of the Atlantic mine at Iron Belt, Mich., has commenced the sinking of the new shaft on the east end of its property, which was begun two years ago but was abandoned during the hard times of 1896. The shaft is 22 feet long, 14 feet wide and having two skip roads, one elevator and one ladder road, and only sawed timber is used in its construction.

Some improvements are being made at the Aragon mine. A new boiler house, 45x50 feet, is under way at the Harrison shaft, and 550 h. p. boilers will be installed. The shaft will be sunk 500 feet additional. Considerable new ground is being opened up and the output of 1898 will be large. The force is 475 men.

The records of the Duluth and Two Harbors docks show large increases in 1897 over the average of cargoes in other years—about 700 tons per cargo over 1896, or 24 per cent. The largest cargo out of Two Harbors was that of the Empire City, 5,622 gross tons. This is 1,104 gross tons in excess of the maximum for 1896.

At the Fayal mine 460 men are now at work mining and sinking No. 3 shaft. Stock piles are lengthening at a very rapid rate. The company now has a complete electric light plant of 500 incandescent lamps in operation on surface and underground.

C. W. RICHARDS, of Cleveland, who went to Japan some months ago to superintend the erection of a wire nail plant, for which the machinery was built by the Cleveland Punch & Shear Works, has returned to the United States. The plant, which was erected at Tokio, has a capacity of 500 kegs of nails daily, and 1,000 wooden kegs.

PROSPECTS of the Pullman Co. for 1898 are reported to be bright, the outlook being that the output will be as large as in any year of the company's history. In the past 10 days the B. & O. orders, with those of the Baltimore & Ohio Southwestern and its other connections have amounted to 4,000 cars, and other good orders are being received.

THE American Ax & Tool Co. has been incorporated in Pennsylvania, with $2,000,000 capital, the charter of the company, which was incorporated in Kentucky, in 1891, with $4,000,000 capital, having been transferred. The present headquarters are in New York, but will be removed to Charleroi, Pa., where a new plant will be erected. It is expected to have it in operation in six or eight months and an output of 1,000 dozen chopping axes and 500 dozen edge tools a day is expected. Plans have been drawn by Struthers & Hannah, Pittsburg, and bids are being received. The tract secured takes in about 20 acres of land. A merging of various companies manufacturing edge tools, in the American Ax & Tool Co. will take place and manufacture will be concentrated at the Charleroi plant.

President Gates on the Outlook.

John W. Gates, president of the Illinois Steel Co., makes the following statements in a newspaper interview, on the iron and steel situation:

"I firmly believe America is entering upon a new era of low prices, large production, and economical handling of large industries that will result in the greatest prosperity the country has ever known. Hereafter the market will be strong, demand good, and prices probably a little higher than the present rock-bottom figures, but there will be no inflation. The Illinois Steel Co. is in better condition than ever before. It started upon the year 1897 with a deficit of $350,000. It has wiped this out, paid all fixed charges and interest, charged off $1,000,000 to depreciation in value of its possessions, and is ready to start in the year 1898 in good condition. With advance orders already in for 800,000 tons of product, large profits for the coming year are assured. Of the profits a considerable portion will be spent in improving the present plant, but no large additions are contemplated. Europe is already worried over the competition of American products. All we need now is subsidized steamship lines from the principal American ports to foreign ports, and the iron and steel products of America will be able to take possession of the markets of the world. The year 1893 has been for America a blessing in disguise. American workingmen will not forget the lesson of 1893 and 1896, which has showed them that labor and capital must go hand in hand."

THE building occupied by Dawson & Goodwin, machinery dealers at South Canal and Washington sts., Chicago, was damaged by fire last week, causing a loss of several thousand dollars to Dawson & Goodwin, and a considerable loss to the sub-tenants who occupy the upper floors.

THE Rankin, Pa., plant of the Consolidated Steel & Wire Co., which has been idle undergoing repairs, resumed in full on Monday.

THE new Neshannock Tin Plate Co., of New Castle, Pa., expects to have the plant in operation by Jan. 15. The plant is the enlarged and remodeled mills of Geo. W. Johnson & Sons.

THE county commissioners of Allegheny County, Maryland, want to buy interior steel or iron shutters for the windows of the vaults of the the new Court House. The shutters must be fire and burglar proof. Wm. J. Miller, clerk to County Commissioners, Cumberland, Md., is the person to address.

THE stock of pig iron in the yards of the American Pig Iron Storage Warrant Co. Dec. 20, was 260,100 tons, an increase of 3,000 tons in 10 days. On the same date last year the amount was 198,800 tons.

DUNTLEY pneumatic riveting machines, in use at the Globe Iron Works Co.'s shipyards in Cleveland, were inspected last week by Henry West, of the Cramp Co., Philadelphia, and by J. W. and J. F. Duntley, and by F. A. Kirby, of Detroit. The party also went to Detroit to see the operation of machinery in use at the yards of the Detroit Dry Dock Co.

A CHARTER was issued at the State Department of Pennsylvania on Monday, to the Dunn Iron & Steel Mfg. Co., of Pittsburg, capital $5,000. Incorporators: Frank Moore, William T. Dunn, Edward P. Botsford, Alvin K. Riley, George Rollings, all of Pittsburg. The incorporators are all connected with the Pittsburg Malleable Iron Co.

THE annual meeting of the stockholders of the New Castle Steel & Tin Plate Co. was held last week, and formal action taken against consolidating the plant with the other New Castle tin mills.

NOTES ON MINING AND TRANSPORTATION.*

BY HARRY J. LEWIS.

Without the railroad, the product of the mine would be limited, both in tonnage and area of distribution. Without the mine, the fuel supply of the railroad would be limited, practically, to wood and oil and, with the increased demand upon these, the price would rise so high as to affect materially the cost of operation. Thus, the railroads are not only the best single customer of the mines, but they also receive more tonnage from this source direct than from any other. Their revenue is also largely derived from the finished products resulting from the assembling and working of ore, fuel and flux. These two industries and those resulting therefrom, are so closely allied that it is hardly possible to discuss one without involving the other, and it is well within the facts to say that mining and transportation, in a broad sense, are by far the largest single factors in the development and extension of modern civilization.

Transportation by water also owes much of its development to the application of steam power and a large portion of its traffic to the product of coal and ore mines. The waterway of the great lakes exerts a greater influence on the inland traffic of the country than any other line of water shipment, and the coal shipments on the Ohio River and its tributaries are probably next in importance.

The total ore shipments by way of the lakes for the season of 1897 amount to 12,215,645 gross tons and the tonnage of coal in the opposite direction is approximately 6,500,000, or about one-half. The total tonnage of coal down the Ohio River through Davis Island Dam in 1896 was 3,811,759 net tons and the Kanawha River probably sent out as much or more, but this traffic is in one direction only. To this should be added a considerable tonnage delivered in Pittsburg and vicinity.

Although commanding the lowest rate of freight, coal is by no means an unimportant factor in railway earnings, as, under good traffic management, it furnishes a return lading for equipment which would otherwise be hauled empty in one direction. The soundness of this policy has been demonstrated by the events of the past few years of depression of mining interests, in common with our other industries, in which the roads which had a coal traffic in one direction only have been gradually squeezed out by those whose lading was in better balance.

Pittsburg's supremacy in the steel trade depends almost wholly on this matter of return lading under the present conditions of assembling ore and fuel. Leaving out of the question everything but the ore and fuel necessary to the production of steel, the Pittsburg district could not hope to assemble at minimum cost more than one-third of the total product of the Lake Superior ore mines, together with the necessary amount of Connellsville coke. The reason for this lies in the fact that the production of a ton of pig metal requires about two tons of ore to one of fuel. As a result, for every two tons of ore which came to Pittsburg to produce a single ton of pig, two tons of fuel could go back to meet the ore at points from which the resulting two tons of finished metal could reach market with minimum freight charge. This would mean a large group of furnaces and mills along the south shore of Lake Erie, shipping metal to the great central district, while the Northwest would be supplied from furnaces and mills probably best located at the head of navigation on Lake Superior

Our defense against this tendency lies in the possession of a field of coal which is so well adapted to any and all uses and which commands a market along and even beyond the lines of transportation which bring down the ore. The coal which goes back as a return lading against the ore coming in this direction is required by the Northwest for railroad fuel, for general manufacturing, for water works and power plants, for gas, for public and private heating and for domestic use, and the amount needed is so great as to balance a large portion of the total ore shipments. The importance of this factor of Pittsburg's future in the steel trade should not be underestimated.

That this field will widen is most probable, for it is important to consumers burning a fuel whose cost has been increased by transporation charges to twice or three times its value at the mine, that they should secure the maximum of efficiency from every ton. The employment of the mechanical engineer in tests of fuel economy has been one of the most convincing arguments in favor of Pittsburg coal in the Northwest territory.

This exchange of ore and fuel is greatly facilitated by the fact that the same railroad and vessel eqnipment is adapted to both uses, and the enforced economies of late years have brought about a development of hopper cars, coal dumpers, ore unloaders, and vessel hulls with standard size and spacing of hatches and interiors clear of obstruction, so that both the cost and waste of transfer have been greatly reduced. All this has a tendency to increase the radius of distribution of the coal mines and still further safeguard the incoming tonnage of ore.

The manufacture of a considerable tonnage of steel at Lake Erie ports offers considerable inducements if full advantage be taken of all favorable circumstances. To begin with, the location must be such that the ore can be dumped into the stock piles direct from the vessel with sufficient storage to carry the furnaces through the season of closed navigation. The labor of handling from stock pile to furnace during this season must be reduced to a minimum, and in the season of open navigation second handling must be done away with entirely by means of bins, chutes and conveyors.

Another point in favor of Lake Erie plants is the practice of stocking on the docks a large percentage of the ore brought down during the navigation season, and which is handled during the winter by the railroads. From this stock the furnaces of the Pittsburg and Wheeling districts and the Mahoning and Shenango valleys are supplied during the winter according to their current needs. The ore thus in stock at Lake Erie ports on Dec. 1, 1897, amounted to 5,923,755 gross tons, or nearly 60 per cent of the total season's receipts of 10,120,906 tons. [The proportion of ore sent to furnaces in the season of navigation is greater than would be inferred from this statement, however. In addition to the 41 per cent of 10,120,906 tons, the equivalent of the 3,256,497 tons on dock May 1, 1897, was moved between May 1 and Dec. 1.—ED.] Under present conditions it is not feasible to stock coal in a similar manner at Lake Erie docks during the winter, as the advent of car dumping machines has effected such economies in transfer at these points as to make shipments from the mines direct to upper lake ports a necessity. Therefore the railroads in seeking a return lading for winter shipments of ore, must endeavor to stimulate a movement of fuel to lake points, and in so doing should take care of a considerable furnace capacity, even if the handling of its summer fuel should involve some little hardship. From the best information obtainable, there is at present a considerable balance of ore from the lakes over the returning coal even in the navigation season, and from this it would appear that the transportation interests should encourage a greater furnace capacity.

The operation of by-product coke plants in connection with these furnaces would enable the railroads to handle the fuel in its original condition, at a low rate of freight and in the same equipment used for carrying the ore. The furnaces would derive the advantage of having a large portion of the gas from these ovens for use as a convenient auxiliary fuel for carrying their product to a more finished stage on the premises. The advantages of operating a furnace plant and finishing mill in close proximity, need no discussion here. The use of hot metal direct from the blast furnace in the various processes of steel making, effects fuel economies which can be obtained in no other way, and this is already a matter of record. The further economies resulting from the association of a by-product coke plant with the furnace and finishing mill should commend themselves especially to the owners and projectors of Lake Erie steel plants.

Although the interests of mining and transportation are almost inseparable, the continual trend of legislation has been to prevent them from being carried on under the same management. This has been met by the organization of corporations which, though differing in name were identical in interest, and thus the spirit of these laws has been practically violated while conforming to their letter. A further step in this direction is the practical consolidation of an ore-consuming interest which already controlled its own fuel supply with iron mining properties, together with railroad and vessel lines for its transportation. If this combination proves successful, and there is no present reason to doubt it, another instance will be afforded of the futility of attempting to control the natural destinies of trade by legislation.

*Read at the winter meeting of the Western Pennsylvania Mining Institute, Pittsburg, Dec. 21-23.

COFFIELD GAS AND GASOLINE ENGINE.

As the field of gas engines, which was at first regarded as properly limited to small machinery—printing presses, pumps, etc.—has been extended to general manufacturing, the running of small shops and in some cases of large mills or cotton ginneries, the construction has been more and more studied with reference to this wider range of service. The advantages claimed for the gas engine of whatever form of construction have been set forth repeatedly in descriptions of these forms of motor, and in the main the details of each type involve a good deal of repetition. However, there are special uses which are more closely met by one form of construction than another, and now and then some notable departures from the beaten track are made.

In the Coffield engine, which is shown in the accompanying cuts, provision has been made first of all for the use of either gas or gasoline. The mechanism that furnishes gasoline is simple and is positive in its operation, so that when once regulated it can be locked in position and will not need attention in that respect again. The change from gas to gasoline can be made while the engine is running. The cooling of the cylinder is accomplished by passing a stream of water through the water-space of the engine cylinder directly from a hydrant, or by allowing the water to circulate through the engine from a tank. The construction of the engine is such that a minimum of water is needed to keep it cool, the construction being such that cold air is admitted and discharged rapidly between the power charges. Where the water used is metered, the amount used becomes a factor.

Lubrication of the wrist pin, on a center crank engine, with two balance wheels outside of main bearings is difficult. In this case a patent oiler is provided which may be filled or adjusted while the engine is running. The lubrication of the cylinder is through a special device, also; in other parts oil-cups are provided. To change the speed while the engine is running, a thumb nut is turned. Control of the engine is readily secured; there is but one small tension spring, and this performs other offices besides governing the speed. This spring takes up lost motion and prevents the governor from becoming variable. A quick-stop lever, from two to three inches long, connected with this regulating device, can be thrown into position, to prevent the engine taking into the cylinder any more explosive mixture, at the same time cutting off the electric current. By stopping the engine with this lever, all compression is prevented, and when the momentum of the fly-wheels ceases the engine comes to a dead stop. The igniter makes only as many sparks as there are power charges taken into the cylinder. This draws lightly upon the battery.

The Coffield engine may be equipped with either one of two gasoline attachments, the gravity system or the lift system. The former is used in connection with an elevated gasoline tank, which allows the gasoline to flow to the pump by gravity. The latter is used where it is desired to have the gasoline tank located at some distance from the engine and on a lower level. Either attachment is adjustable, and when the proper mixture is obtained, can be locked in position, requiring no further special attention. For use in connection with a dynamo for electric lighting, the engine is equipped with a special automatic throttling device which gives regular speed and develops a practically steady light for all commercial purposes. With this device the engine takes a charge at every second revolution, the amount of gas to each charge being regulated automatically.

The Coffield engine is built by W. P. Callahan & Co., of Dayton, O.

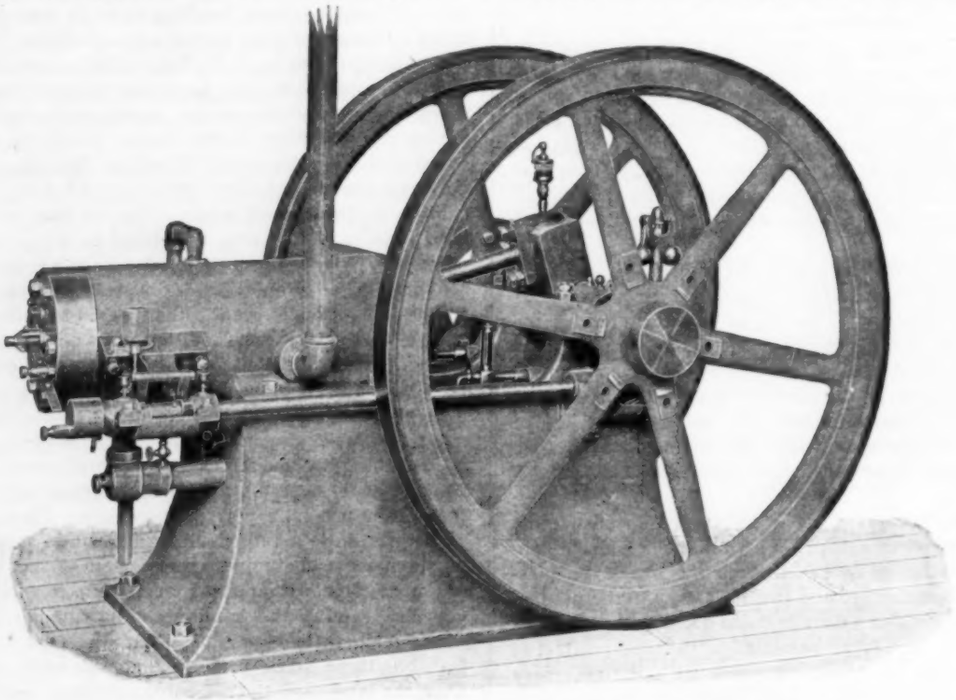

FIG. 1.—STYLE OF 2, 4 AND 6 H. P. COFFIELD GAS AND GASOLINE ENGINES.

Low Railroad Rates One Drawback.

"The Auditor" writes in the *Railway Age* of one phase of the industrial situation that is worse rather than better:

"What the railroads ought to have, of course, is higher average rates. When it gets down to an average ton per mile at .596 cent on the Erie, .564 on the Pennsylvania lines east, .524 on the B. & O., .510 on the C. & E. I., .441 on the Norfolk & Western and .419 on the C. & O., the situation is not far from ridiculous. It is useless to say 'permit the roads to charge higher rates,' because they are 'permitted' to do so now. Nothing prevents them except that they prevent each other, and to-day, with practically all the tonnage they want, and often more than they can handle, it is a scandalous fact that rates as a whole are probably in worse condition than at any former time. I do not mean that any particular group of rates is being cut beyond precedent; but the entire situation is completely out of hand. Things are all at sixes and sevens and there appears not to be any fear of God nor of the Brown decision, nor of the rules of traffic associations.

"As to 'what you can do' it would be easy to say off-hand 'give them a pooling bill;' but what pooling bill and what will they do with it when they get it? If a law could be passed to read as follows: 'Be it enacted, etc., that hereafter any or all carriers may be allowed to form any pools or combinations that they please covering any or all of their traffic or revenue, as they shall see fit, without restraint or hindrance. Effective from the passage of this act.' If, as I say, such a law could be passed, we may presume that all railways would be willing to accept it. But such a law cannot be passed; and what kind of a law can be passed and whether it is worth paying the price to get it, are subjects on which so far railway men themselves are not agreed."

BEHAVIOR OF CAST IRON UNDER IMPACT.

In our issue following the December meeting of the American Society of Mechanical Engineers at New York we printed a synopsis of Mr. W. J. Keep's paper on "Cast Iron Under Impact," in which were detailed some recent experiments of the writer with tumbled test bars. In the same connection Mr. Thos. D. West's discussion of the paper was printed. Below we give the comments of Mr. Strickland L. Kneass, of Philadelphia, on the paper, as they were read at the meeting:

"This paper by Mr. Keep certainly shows a commendable amount of industry, but it is doubtful if it can be regarded as a final contribution to the literature on the 'Behavior of Cast Iron Under Impact.' Even a hasty reading gives the impression that the author is not sure of his ground, while it is obvious that his theorems are not always proved, not his material thoroughly digested. The line of his experiments would seem to be too narrow to allow the validity of his general conclusions, while others are based on measurements of rough castings, from which a deviation of from 1-10,000 to 8-10,000 would entirely upset his deductions. Several contradictions occur, one of the most unfortunate for the author's theory being on page 3, line 3, where he states that of 11 test bars in series *m*, six had grown shorter, four were unchanged and one had grown longer, while on page 7, last paragraph, 'all milled bars reported in this paper were measured and gained in length.' The gains of a number of bars are given in Table III, series *m*, showing the gain at the end of each half hour, etc., so that the reader is left in doubt as to the facts, and it is impossible to discuss intelligently this part of his paper, or the appended tables. Another table, containing some very interesting statements, if true, is the last part of IX, where the author shows that the effect of 'milling' is to increase the total carbon, in one case as much as 0.13. This statement is so extraordinary that it would require many more experiments than given, to prove that the total quantity of one of the constituent elements of cast iron could be changed by mechanical manipulation. Yet if these tables are incorrect, no strength is added to the confidence in the accuracy of the figures in the other tables.

"Referring to the more important part of the paper, the following theorem is noted: 'The strength gained by milling is due to making the surface of the test bar smooth and to condensing the surface by peening.' This is apparently laid down as a general law and is stated as proved. There is no doubt that milling increases the transverse strength, but the author's conclusion cannot be accepted entire. Table VII indicates a gain in strength in all the series in which the bars were pounded, namely 27, 29, 30, and 31. If a bar be of the same cross section and homogeneous, it would necessarily break at the center under these transverse tests, and if peening produce the increase in strength, it would have to be done at the center to obtain any gain. But here, no matter where the bar is treated there is an increase in transverse strength. Further, according to the author's theorem, end blows would not produce this effect. His own Table V, proves that they do have some influence, although, of course, not as great as milling. Taking the average of the series 9 to 17, inclusive, where the bars were treated with 3,000 blows and over, there is a gain of 7 pounds. It is true that the effect of side blows upon soft iron bars is to peen the surface and to increase the strength, but it is the contention of the writer that this is not the sole cause and that Mr. Keep's own tests show the fallacy of his theorem. In a paper read before the American Institute of Mining Engineers, in 1896, Mr. A. E. Outerbridge gives the results of a large number of experiments with cast iron bars, one inch square, subjected to side and also to end blows. He found the effect was the same in both cases. Subsequently, the Franklin Institute made a special examination of the subject, and in a report which corroborated the results obtained by Mr. Outerbridge in his original experiments, agreed with him in his theory as to the probable reason for the increase in strength due to milling. Through the courtesy of Dr. Wahl, Secretary of the Franklin Institute, the writer was given access to this special report and is permitted to state that the average gain in transverse strength of 92 bars over their companion bars, due to milling, was over 18 per cent. The theory advanced by Mr. Outerbridge to account for his observations, was that of the 'Mobility of the Molecules of Cast Iron' at ordinary temperatures and that the increase of strength is due to relief of internal strains, due to vibration. These vibrations may be produced by milling by end or side blows or in any manner desired. The tests made by Mr. Keep were made with bars of one quarter the sectional area, although of the same length as those used in Mr. Outerbridge's tests, and it is possible that this, as well as the entirely different quality of irons used, would account for the comparatively small effect produced by end blows in Mr. Keep's apparatus. The former used ordinary foundry iron; Mr. Keep, probably stove plate iron, containing twice as much silicon. It seems, therefore, that the author's experiments were carried on in too narrow lines to justify his generalizied theorem as cited above, and his own tests seem to be best accounted for by the more scientific theory.

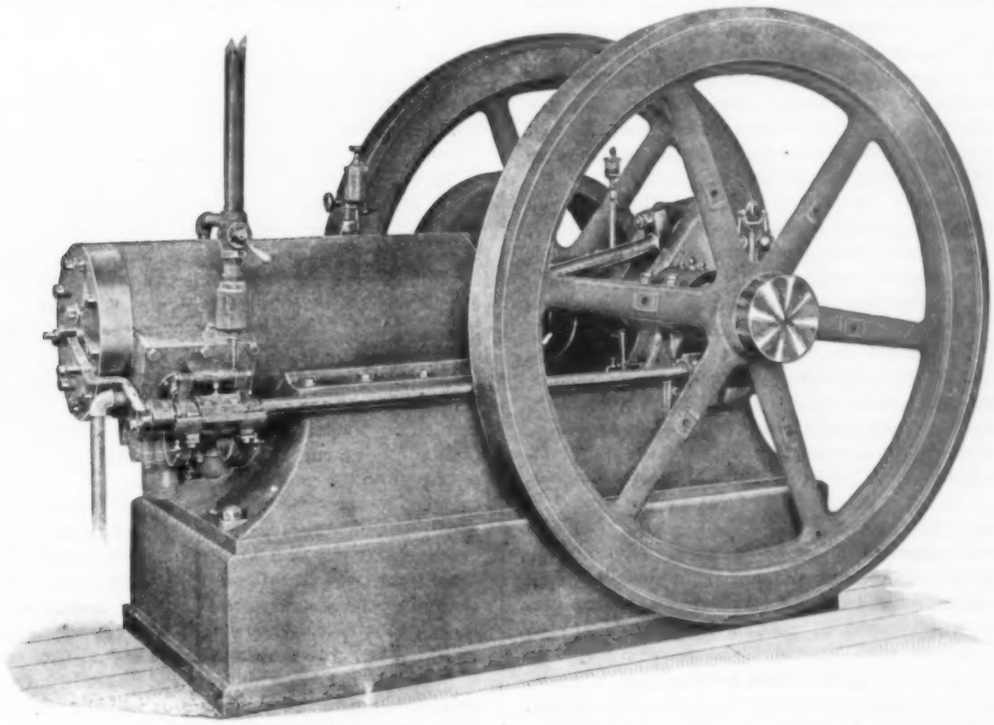

FIG. 2.—STYLE OF COFFIELD GAS AND GASOLINE ENGINES FROM 8 H. P. TO 100 H. P. SHOWING ENGINE ON STONE FOUNDATION.

PROGRESS IN METALLOGRAPHY.

[Translated and condensed for The Iron Trade Review by Dr. Richard Moldenke.]

Baumaterialienkunde, Vol. II., No. 4, gives the famous report of Prof. Osmond on "The Science of Metallography as a Method of Investigation," made to the International Society for the Testing of Materials of Construction. The report is illustrated with 40 of the finest reproductions of metallographic studies so far published. The whole subject is treated in a thorough manner, and a number of co-ordinate branches of the natural sciences are drawn in, most of which are outside of the domain of the iron trade. As a consequence only the essential portions are gone into here at any length.

Prof. Osmond begins by defining metallography in its widest sense as the study of the physical structure of the metals and their alloys. The microscope must not be considered the only piece of apparatus available for this purpose, but to a limited degree the resources of analytical chemistry, micro-chemistry, crystallography, and experimental physics should be made use of; likewise the optical characteristics, such as color, lustre, shape, etc.

Prof. Osmond makes a comparative study of the relation of metallography to anatomy, biology, and pathology, giving each branch the thorough consideration he is noted for. The first consideration in the study of a metal is the notation of its optical properties, such as color and lustre; its behavior with chemical re-agents, the formation of films, reactions, etc.; the mechanical properties, such as the resistance to abrasion and hardness; the crystalline structure, if there is such a one, with the taking of relative measurements, and the determination of the planes of least cohesion.

The second division of the subject is the constitution of the metal or alloy, the shape and dimensions of the constituents, and their relation to each other—when in a normal condition. These results are compared with similar ones obtained from the same piece after the heat or mechanical treatments received during the processes of manufacture.

The third division relates to the study of faulty treatment given to metals, and of the foreign admixtures which produce distinctive properties of various kinds. This branch is of especial importance in the daily work. To illustrate these three points more fully examples are taken from the published experiences of noted workers in this line of investigation.

In the study of anatomical metallography, Prof. Osmond gives the microstructure of silver as an example of a very simple and regular arrangement of cubes side by side. Next comes a piece of hammered basic ingot iron with 0.125 carbon. This iron was polished on parchment paper with the aid of gypsum, and then etched. The resulting surface shows a general uniformity, but varies from grain to grain. This is explained by noting the manner of cutting the section. The crystals which are cut parallel to the two axes appearing as regular as those of the silver. Those cut perpendicular to the two axes, or, in other words, parallel to the third, appear of a slaty nature, that is laminated like a slate formation; and those cut at other angles are indistinct. The result is that we have to do with two sets of planes of weakness, the one between the crystals themselves, and the other due to the laminar structure of the individual crystals.

The juncture planes of the crystals are the natural gathering places of the gases, which form while the metal sets; again, these planes form the starting points of the ruptures produced by subsequent strains. The attention of metallurgists must be directed toward the suppression of these planes of contact so far as it is possible, by preventing the formation of gases to some extent, and by a quicker cooling off of the melted metal, thus reducing the size of the crystals.

It will be seen that a body which appears perfectly homogeneous to the chemist is really a very complicated one structurally. Moreover, it will usually be found to exhibit chemical differences when properly examined by metallographic methods. The above statement is enlarged upon by a description of some with alloys of gold and aluminum, lead, iron, etc., in which the study of coloring the material by heat or chemical means differentiates and brings out the various constituents. Again, the differentiation of the most minute particles of an etched surface by means of the dispersion of light beams thrown upon it gives us the means of judging differences by the successive color tones from yellow to black. Coloring the metal is not the only resource of anatomical metallography. We have a hardness test by Behrens, in which the surface of a metal is scratched with a series of needles of graduated hardness. Some constituents are scratched and others are not, thus affording a ready means of separation. This method is, however, only reliable for the larger samples, the more delicate ones being treated better by polishing on a soft surface, producing results in relief. Thus carbide of iron will remain while the softer matrix is removed. The same result is obtained by etching, but may suffer somewhat through indistinctness. The best method is a combination one in which polishing and etching is done side by side. Here the water which is used on the parchment paper for polishing the sections is replaced by extract of liquorice, which has a slight solving action on the iron and yet does not rob it of its lustre. This method is especially applicable to the development of the irridescent constituent of a slowly cooled steel called pearlite.

The above described methods, while they serve to distinguish the various constituents from each other, by no means give sufficient data to base a final judgment upon. One and the same body when viewed from various directions may exhibit entirely different properties and hence mistakes in this study have frequently occurred. It is therefore advisable to obtain verification of an observed point by employing other methods independently before resting satisfied. An example of this is furnished in the critical discussion of the constitution of pearlite in steel. Here metallography and analytical chemistry aid each other in solving the problem.

Once we have distinguished the various constituents of a metal or alloy, the next point to be considered is the determination of form and dimensions. That is to say, we must seek to discover the reason for noted changes in structure. This is the biological part of metallography. The life of a metal consists of a series of changes coincident with its manufacture and use. Temperature, pressure, and time, are the chief elements affecting it during its life. The results of heat changes during a given time are of two kinds:—The continuous and the critical ones. These are best recorded and studied by means of diagrams. The sudden breaks in the continuity of a curve show a critical change in the application of energy to the material.

Every metal possesses at least two critical points, those of melting and volatilization, both of them necessitating a change in its physical condition. Many other materials have more than two critical points, and these are called allotropic changes if the bodies are simple elements, such as iron, nickel, cobalt, sulphur, etc. If compound, such as silver iodide, nitre, etc., the change is called an isomeric one. Thus if pure iron is melted and allowed to solidify, time and temperature being recorded, a curve will be obtained showing three distinct separations. If a mixture of several pure substances is investigated there will be found just as many points of solidification as there are substances, in addition to these also their individual allotropic or isomeric modifications. Spiegeleisen with 20 per cent manganese has two such points, one of 1,985 degrees and the other at 1,825 degrees F. Another alloy of the same class shows this also, a certain fixed carbide solidifying at one temperature and a solution of this same carbide in the matrix at another. Curves of these kinds when interpreted with the aid of chemistry often disclose to us what would otherwise remain hidden. Thus in an alloy of copper and silver the metal present in excess begins to separate and as the temperature of the melt is lowered, until a point is reached when both metals are, so to speak, saturated with each other. This occurs when silver is 72 per cent and copper 28 per cent. At this point both metals, if kept at a constant temperature solidify in the form of a mechanical mixture. This is a so-called entectic alloy, the only one whose ingots do not show any shrinkage whatever. Tracing the phenomena to solids we come to steel. Prof. Osmond now interprets the curves made by a variety of steels when under heat influences. The point of recalescence is gone into and comparisons made with the silver-copper alloy diagrams. Thus it is shown that there is a remarkable similarity to be found in the behavior of pure iron and carbide of iron in steels when compared with the entectic alloy of silver-

copper, and the philosophy of annealing and quenching steels as viewed from the standpoint of this interesting alloy furnish very interesting reading. Bronzes are now gone into, and it is shown that without the aid of metallographic research very little of definite value regarding the constitution of the copper-tin alloys would be known. The influence exerted by pressure must be taken into account also. This is seen especially in hammered materials, the quicker cooling of the outer layers in contracting exerting a powerful pressure upon the interior. The effect is to send the critical point upwards, diminishing the recalescence, and in general playing an important part in the structural changes of the metal.

Coming now to pathological metallography, or the diseases of metals, we first note the effects of overheating in the numerous cracks produced and the large size of the crystals. Then the entrained slag, which if in small grains, is not so serious, but when present in quantities and especially at the surface it may give rise to rupture under strain by forming the starting point of the break. Sulphur in steel acts similarly. Mr. Stead has devised an ingenious method of showing this point by cutting a strip of the metal polishing and etching it, then bending until it cracks and observing the starting point of the rupture. In wrought iron the cracks began at the slag spots, in steel at the cementite. Foreign bodies exert considerable influence for either good or evil. They may be in solution under all conditions, or else be affected by a rise in temperature causing them to either segregate or move about. Gold with bismuth or antimony shows this very plainly. Reheating a metal with a high melting point, at a somewhat lower temperature, and in the presence of impurities often affects it seriously, a point which requires further study to accurately grasp its bearings. It is not easy to distinguish the actual disease of a metal from a purely structural variation. If it has received proper heat treatment it certainly should be in good condition, but if not treated properly it is unsafe. Thus three samples of the same steel after forging are heated to 1,380 degrees, 1,850 degrees, and 2,535 degrees F., respectively. They are still mixtures of iron and pearlite, but what a variation between them. The last named has very large sized crystals, and in fact the size of the crystals is a good indication of the heat treatment a piece has received.

Prof. Osmond concludes that it is our duty to perfect every aid to the study of materials which are used for structural purposes, and among the most promising is the science of metallography.

SHIPPING firms controlling more than 100,000 gross tons in sea-going ships are rare. England has half a dozen—the Peninsular & Oriental with 60 ships of 283,140 tons; British India, 97 ships of 251,430 tons; Wilson line, 82 ships of 159,800 tons; Pacific Steam, 41 ships of 128,400 tons; Cunard, 72 ships of 119,500 tons; White Star, 21 ships of 114,290 tons. Germany has only three, but now holds the record for the largest steamer, the largest sailing-ship, and the largest tonnage controlled by one company. The Hamburg-American has 69 ships of 286,950 tons; North-German Lloyd, 67 ships of 265,600 tons; Hamburg and South American, 32 ships of 100,650 tons. France has but two—the Messageries Maritimes, with 63 ships of 229,850 tons; and the Compagnie Generale Transatlantique, with 64 ships of 166,700 tons. Italy, Austria, Spain and Japan have one each. The United States has none.—[Marine Review.

THE Manufacturers' Advertising Bureau, located at 126 Liberty st., New York, is credited with knowing how to manage a manufacturer's advertising and newspaper work so that it will pay him, working in harmony with the policy of the advertiser, and becoming virtually another right hand at work for his advantage and profit. The Bureau is the largest user of advertising space in the trade journals in the country, and has accumulated an experience, through nearly 20 years of business life, available to draw upon for the benefit of its clients. Benj. R. Western, the proprietor, has been a newspaper man for many years and his intimate acquaintance with trade journal advertising was acquired in connection with the management of journals of this class. The Manufacturer's Advertising Bureau has established itself as one of the strong concerns of the country. A business booklet, "Advertising for Profit," is issued by Mr. Western that tells how he and his associates work, and is sent on application.

NICKEL STEEL FORGINGS.

While the use of nickel steel forgings for certain important parts of heavy stationary and marine engines has become quite general, yet only occasionally do we hear of nickel steel being used for locomotive crosshead pins, crank-pins, piston rods and driving axles. It is conceded by the best authorities that from nickel steel, properly worked, forgings of such parts can now be made which greatly excel similar forgings of all other materials in elastic strength and in toughness.

Probably the cause for this delayed introduction may be found in the greater cost of nickel steel, the greater cost of working and the comparatively short time this material has been successfully made. Also, until quite recently an opinion prevailed that steel forgings generally were unreliable. This was due largely to the poor work turned out in the beginning at some of the steel forges, and unfortunately some of these concerns are still at work furnishing material of an inferior grade at unreasonably low prices. However, certain steel forges, by improving facilities and processes, have made a well-deserved reputation for the quality of their high-grade steel forgings, and in this way have done much toward the introduction of this material in machinery construction. While the prejudice against steel forgings is fast disappearing among better informed engineers, there remain a few, especially in the West, who prefer iron to steel on account of "fiber." There seems to be no good reason for this preference, as so-called "fiber" is due to the presence of cinder in the iron, which cannot be a desirable constituent of a forging which depends upon the sounds of its welds to hold it together. The true reason for this preference is likely to be found in the fact that wrought iron will endure all kinds of abuse of work and heat treatment and show no bad effects, while steel is quickly injured by the bad handling of ignorant workmen. . . .

For locomotive crank-pins, crosshead pins, piston-rods and driving axles, there is no doubt that nickel steel is the best material now available. We are informed that one railroad in the West is now experimenting with nickel steel locomotive stay-bolts, while another intends to try nickel steel plates in boiler construction.

On account of the care which must be taken during the various processes of manufacture to produce nickel steel forgings of the best quality, it is a matter of the first importance that such high-grade material be purchased, under rigid specifications, from those who are experienced and have proper facilities for doing the work. There seems to be reason to believe that as the properties of this material become better known and appreciated by railroad mechanical men its adoption will be quite general for such parts of a locomotive as are subjected to severe alternating stresses and wearing action.—[Railroad Gazette.

The Big 16-inch Coast Defense Gun.

Lieut. G. S. Carden has an interesting illustrated article in *Harper's Weekly* for Dec. 11, giving details of the 16-inch coast defense gun which the Bethlehem Iron Works are building for the War Department. It is proposed to put the gun in a turtle-back turret built upon Romer Shoals, about half way between Nortons Point on Coney Island and Sandy Hook light. It is calculated that the striking energy of the projectile propelled by a 1,000-lb. charge of powder will be 60,000 foot-tons. This is approximately equal to the shock which would result were a 6,000-ton steamer brought to a sudden stop while running at a speed of 16 miles per hour. The following table shows the standing of this gun relative to the big guns of other nations:

	Calibre. In.	Wt. of Gun. Tons.	Length. Ft.	Wt. of Shell. Lbs.	Wt. of Powder Charge. Lbs.
United States	16	126	49.1	2,350	1,000
German	16.5	120	45.9	2,204	903
Italy	17	104	40.75	2,000	920
England	16.25	110.5	43	1,800	960
France	16.54	74.2	32.5	1,719.6	595.2

The range will be over 16 miles. If present plans are carried out New York will have eventually 14 such great weapons of defense.

HOW TO MAKE HIGH-SILICON IRONS.

BY WM. B. PHILLIPS.

The course of a great part of the Southern iron trade during the past two years is of no little interest to those who study it from the standpoint of chemical analysis. During this period a lower silicon content, in the upper grades, has been observed than at any time since the production of coke iron assumed respectable proportions. Ten years ago the silicon in the foundry grades averaged about 3.25 per cent. It was not unusual to find 3.60 per cent in No. 1 foundry, and from 2.75 to 3.00 per cent in No. 3 foundry. Silvery irons carried from 5 to 6 per cent of silicon. About five years ago a change toward lower silicon began, and has continued to develop until now it is often the case that iron graded on the yard as No. 2 soft does not carry even 3 per cent of silicon, and so-called No. 2 foundry is down to 2 per cent, and even below this amount. In the Birmingham district, it has become difficult to make high silicon grades. Formerly it was difficult to make low silicon iron, but now the pendulum has swung to the opposite extreme, and we are having a period of low silicon iron, with a scarcity of silicon in the upper grades. But the old absurdity of grading iron on the yard without respect to composition still continues, and manifests an amazing vitality. Speak of the Fountain of Perpetual Youth! It is a wretched little trickle compared to the Silver Spring in Florida, when one considers the perennial flow of yard grading. It is as old as the Wandering Jew, as pompous as Don Quixote, and as absurd as Tartarin. And yet it is here and promises to straddle the neck of the iron trade as persistently as the Old Man of the Sea clung to Sinbad, the Sailor.

The iron may change its composition utterly, so far as silicon is concerned, No. 2C and No. 1C may be down to 3.50 per cent, No. 2 soft below 3 per cent, and No. 2 foundry below 2 per cent, but the hero of Tarascon still guards the lion's cage, and looks fiercely at all new-comers. But the fact remains that high silicon iron is scarce and hard to make.

Ten years ago, even five years ago, the practice in the Birmingham district, at least, was to use a large proportion of the more silicious "soft" red ore, practically lime-free, and to use limestone, and some "hard" ore as fluxing material. When the "hard" (limy) ore was struck in a certain soft ore drift the owners of the property thought that they were ruined, as the mine-foreman reported that the ore had "petered out." The main dependence was on the "soft" ore, and the limy ore was not considered as of much, if any, value. The enormous drain to which the "soft" ore has been subjected, owing to its ready accessibility, higher content of iron, and comparative cheapness, at last has made itself felt. The richer and cheaper ore is beginning to become somewhat scarce, and of necessity iron-makers have been compelled to use the limy ore. This condition of affairs arises also, in part, from the topography of the seams. The limy ore, being for the most part the continuation of the "soft" ore under cover in order to avoid the necessity of purchasing long strips of land the miners began to work the ore on the dip. As they did so the ore became more and more limy, so that it is now not uncommon for it to contain 20 per cent of lime, while the iron has fallen to 35 or 36 per cent.

In its best estate the limy ore is self-fluxing, carrying enough lime to flux the silica, and for this reason has come to be highly esteemed. On this account, and because of the lessening supply of the "soft" ore, the use of the limy ore has been increasing for several years past. It has been considered a great advantage to use the limy ore, inasmuch as the use of extraneous flux was thereby diminished. But it costs more to make iron from limy ore, even if it be self-fluxing, than from "soft" ore and limestone. The tables given in my "Iron Making in Alabama," show that with mixtures of soft and limy ore the cost of iron increases as the proportion of limy ore increases. For instance, with 50 per cent of limy ore, and 50 per cent of soft ore, the cost of raw materials per ton of iron was $4.22 and $4.31 with 65.9 per cent limy ore and 34.1 per cent of soft ore the cost was $4.53, $4.66, and $4.65. With 80.7 per cent limy ore and 19.3 per cent soft ore the cost was $4.99, with 91.5 per cent limyore and 8.5 per cent soft ore the cost was $4.71, and with 100 per cent of limy ore the cost was $4.79. The lowest cost per ton of iron, on ore burdens composed of limy and soft ore was, when equal proportions were used, $4.22; and the highest cost was, when 80.7 per cent limy ore and 19.3 per cent soft ore was used, $4.99.

As a general proposition it is certainly true that it costs more to make iron with large proportions of limy ore than with mixtures in which the limy ore forms 50 to 60 per cent. It is also true that it is more difficult to make the high silicon irons with high limy ore burdens than otherwise. And I believe also that to make these irons we shall have to return to the earlier practice here, and replace a considerable part of the self-fluxing limy ore with soft ore and limestone. I say I believe that this will have to be done, for the evidence is not complete and there are even some seemingly contradictory facts opposed to this view. The mere statement of the component parts of a given burden is not sufficient evidence on which to base deductions as to the reactions within the furnace, whether these be chemical, physical, or physico-chemical. We must know the physical condition of the various materials, whether coarse, medium or fine, whether wet or dry, and the succession of the materials charged. We must know also the heat and pressure of the blast, and the amount of the blast per unit of time and the rate of driving. These are all determining factors, and while it may be and doubtless is the case that they vary in importance and that some of them are so elusive in their effects as almost to defy explanation, still a systematic grouping and careful study would shed some light on the problem.

I am convinced of one thing, viz.: that iron masters in the Birmingham district would do well to study this matter of high silicon iron more closely, and from the standpoint of ore supply. The soft ore is going. If its final departure will not seriously affect the cost of making iron, well and good. But if it should, then it is neither so well nor so good. There is a great deal of ore yet, but there is not a great deal of the richer and cheaper soft ore. Immense seams of soft ore are accessible, but the ore from them will have to be concentrated.

Birmingham, Ala., December, 1897.

Faults in Rivet Holes.

In a paper read before the American Society of Civil Engineers respecting the working of soft steel for boilers, J. A. L. Waddell says: All structural metal work, whether it be medium steel, soft steel or even wrought iron, should be punched at least one-eighth inch less than the diameter of the cold rivet and reamed to a diameter 1-16 inch greater than same, and there is no bridge shop in existence which can turn out truly first-class work without sub-punching and reaming or drilling. Even when the greatest care is take in bunching the metal of the component pieces of long members, many of the rivet holes will fail to match by as much as ⅛-inch, and the author has within a year or two seen ⅞-inch rivet holes elongated to 1¼ inches merely to admit the rivets. Where several component pieces containing badly matched rivet holes are placed together and a tapered flexible reamer is used to enlarge the hole sufficiently to admit the rivet, the latter cannot possibly fill completely the irregular hole, and therefore, if left in the piece, cannot act effectively. If condemned by the inspector on account of looseness, and then driven out, it will, on account of its crookedness, materially injure the metal about the hole and thus weaken the structure, perhaps doing more damage thereto than would the leaving in of the loose rivet. The use of the tapered, flexibly connected reamer is all humbug, and is not true reaming at all, but merely a means of making it practicable to get the rivets through badly punched holes that assemble irregularly. Real reaming can only be done with rigid reamers or drills that remain at all times at right angles to the surface reamed and cut a cylindrical instead of a tapered hole. Such reamers as these are the only ones that ought to be employed on first-class metal work, excepting, of course, in confined spaces where they cannot be used and where the flexibly connected reamer must of necessity be employed.

THE laborers employed by the New Castle Wire Nail Co., New Castle, Pa., have been given an unsolicited advance of 10 per cent in wages.

Review of the Technical Press.

[Translations, Condensation and Comment expressly for The Iron Trade Review by Dr. R. G. G. Moldenke.]

Metal Dust and Its Effects —*Dingler's Polytechnisches Journal*, Nov. 12, reviews this subject, originally brought out in the "Gewerbefreund." The fact that the dangerous consequences of breathing metallic particles floating about in the air of workrooms, reveal themselves only a long time afterwards, has left this field of sanitary reform practically untouched. The subject matter is treated at some length, that portion relating to the iron trade only being taken up here. In the cleaning of castings the dust produced is in the shape of small scales which are not easily pulverized. This may then account for the quick settlement of the almost impenetrable dust in the scouring rooms of our large American foundries. Under the microscope this dust appears sharp-edged, holding pointed particles of iron, and exceedingly sharp slivers of quartz from the molding sand. Cast iron turnings make a finer dust, the particles having serrated edges and appearing like rough needles. The dust produced by grinding steel, cutlery, etc., appears like hooks and particles having ragged edges. Brass, bronze and lead dust are described at length. As a consequence of breathing this metallic dust we find the particles of brass and steel acting disastrously on the human organisms. The hooks and serrated edges remain fixed in the lining of the air passages and cannot be removed by coughing. A comparison of the various iron trades shows us that the blacksmith and the machinist suffer but little, while the file cutter is troubled much more, but the most serious case is that of the grinder. Statistical reports from England show that 69 per cent of the grinders suffer from a peculiar form of asthma contracted as a result of their trade, moreover 69 per cent do not attain the age of 41. In the grinding of needles, factories having systems for exhausting the dust-laden air give the employes a chance. They average 50 years of life. Where no such precautions are taken their chances are reduced by 10 to 15 years. It would therefore seem that the grinders at least are entitled to better sanitary protection, as we are perfectly able to abate the evil with the appliances now in the market. In the town of Solingen the yearly mortality was 19.6 per 1,000 inhabitants. Among the iron trades it was 23.0 and with the grinders it rose to 30.4. The average length of life in the town was 54 years. The iron trades had but 48.3, while the grinders again had only 39.4 years. While these figures are a little old, and things have mended somewhat, there is still much to be done, especially in our own country, where there are no laws governing such cases.

Preparation of Chromium.—[*Zeitschrift für Electrochemie*, Oct. 20.]—A very promising method for preparing chromium in the electric furnace, worked out by Aschermann, is described as follows: A gas tight steel furnace is used in connection with a movable compacted electrode. A tight fitting graphite crucible is placed in the furnace and in it are placed oxide of chromium, and sulphide of antimony, in the proportion of 10 to 23. Chromium oxide, sulphur, and antimony, 10 to 10 to 23 can also be used, but the results are not so favorable. After the furnace is closed gas tight, a comparatively light current, say of 20 to 25 amperes, is passed through the material to be melted. A reaction takes place attended with the development of much heat. The resulting mass consists of a regulus of a chromium-antimony alloy, while the upper part of the crucible has an amorphous mass of antimony oxide, sulphide, and traces of chromium oxide, adhering to the walls. Repeated melting of the regulus removes every trace of antimony, although it is much easier to powder and roast this regulus at white heat, when the antimony is driven off. Chromium has the property of dissolving a considerable proportion of carbon, which separates out as graphite again upon cooling. At about 3,600 degrees F., chromium volatizes.

A Direct Process for Tempering Steel While Under Pressure.—[*Stahl und Eisen*, Nov. 1.]—Mr. Haedicke describes a direct process of tempering steel while in the press. It is well known that the tempering of steel can be done in two ways, one by hardening it first on plunging into cold water and then drawing the temper, and the other by plunging the red hot steel into various liquids directly. The temperature of such fluids and their capacities of drawing off heat regulate the degree of temper obtained. In the manufacture of saws the steel is first hardened in oil or fat and then, while still warm, placed in a press between hot dies and the temper thus drawn while under pressure. A special style of a press is shown and described as specially adapted for this work, the dies being hollow and arranged to allow the circulation of steam or hot oil. Arrangements are made to regulate the heat with the aid of specially inserted thermometers. The plates to be hardened and tempered are placed between the heated dies as fast as they come from the ovens and are allowed to cool there to the point desired, while under pressure. The material comes out flat and seldom requires extra straightening. This process is especially adapted to the requirements of cold saw making. The temper obtained is quite uniform, and if it should be desired to have hard edges and a softer interior, arrangements are made to limit the cooling effect to the edges by suitably designed dies, the central portion of their faces consisting of some poorly conducting material. The process is also adapted for the tempering of band saws, and steel ribbons of various shapes. The bands are drawn between the dies of the press continuously, directly from the doors of the furnace.

Continuous Process for Burning Charcoal.—*Stahl und Eisen*, Nov. 1, gives a new process of burning charcoal continuously. The original article by E. F. Ljungberg, appeared in the *Jernkontorets Annaler* in Sweden and describes a circular oven with 4 to 8 compartments. In the first the wood is decomposed, in the second the wood is dried, in the third it is heated up, and in the fourth the process is completed. The gases coming from the decomposition of the wood are burned in No. 2. At least 30 per cent of the water from the wood separates out in No. 3. The preliminary warming of the wood requires about 6 days, the drying and carbonizing 5 more, to complete the process 5 days, and to quench, draw, and refill 4 more days; or in all, 20 days. One oven with 8 compartments, making 146 compartments per year, each containing 2,650 cu. ft., can burn 892,450 cu. ft. wood to 647,550 cu. ft. charcoal. The cost of running is said to be one-third that of the old Meiler. Ten of these ovens are in constant operation, 8 of them being in Domnarfvet.

THE annual oyster roast of the Berlin Iron Bridge Co., on Dec. 15, at the company's shops at East Berlin, Conn., was an event of more than ordinary circumstance. It was given to the employes of the company and their families, but the circle was extended to include the common councils of Hartford, New Britain and Middletown, Conn., and a large number of municipal officers from Meriden, Wallingford and other places. All the New England States and New York and New Jersey were represented, between 1,500 and 2,000 persons enjoying the festivities. The visitors had an opportunity to go over the plant, which has spread over acres of space. The oyster roast and dancing were the evening features of the occasion.

ANGLO-AMERICAN trade statistics are discussed in a late issue of the London *Statist*, and the figures there presented show that the import of American goods into England for 1897 will probably exceed by $400,000,000 the value of British goods exported to America. In 1887 the imports into England exceeding the exports to the United States by $214,000,000; consequently, this balance has almost doubled in 10 years in favor of the United States. The estimated value of the imports by England for 1897 is given as $575,000,000, against $175,000,000, in the value of British goods bought by the United States.

OTIS, HOUGH & Co., Perry-Payne Bldg., Cleveland, sales agents for Jones & Laughlins, Ltd., of Pittsburg, and for other manufacturers, have sent out their leather-bound ready reminder for 1898. With it is the announcement that this firm has the agency for Northern Ohio for the Pennsylvania Tube Works, manufacturers of merchant pipe, tubing, etc., and for J. Painter & Sons Co., manufacturers of hoop and band iron and steel.

COCHRANE HEATERS
FOR HEATING FEED WATER
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USED BY MANY OF THE LARGEST AND BEST PLANTS IN THE U.S.
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FOR TAKING WATER OUT OF STEAM.
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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our davertisers at once.]

The International Machinery Co. has been incorporated at Wheeling, W. Va., with capital stock $100,000 to manufacture molds, castings and structural work, by C. E. Blue, Jr., A. G. Hubbard, Gibson Lamb.

The Ohio Valley Steel Co., Cincinnati, has been incorporated at Columbus, O., capital stock $400,000.

Articles of incorporation have been issued to the Falls Rivet & Machinery Co., Cuyahoga Falls, O., capital $500,000. The company is to manufacture hardware, metallic rivets washers and burrs. The incorporators are N. C. Stone, Samuel Higgs, H. J. Stambaugh, John W. Haines and Arthur Higgs.

The Standard Foundry Supply Co. has been organized for the manufacture and sale of foundry cupolas, center blast tuyeres and castings of all kinds, with the business office at Rutherford, N. J.; capital stock, $125,000, divided into 2,500 shares of $50 each, and to start business with $5,500. Incorporators: W. J. Cole, Rutherford; W. K. Cessna, New York City: John Scott, Ithaca, N. Y.

The Youngstown Forge Co., of Youngstown, O., has been incorporated to manufacture forgings of all kinds. The capital stock of the company is to be $12,000, and Lewis D. Clark, Thomas J. Williams, J. B. Rogers, B. Frank Thomas and A. D. Thomas are the incorporators.

The Dunn Mfg. Co., of Pittsburg, has made application for a charter of incorporation, to engage in the manufacture of iron and steel. The incorporators are Frank Moore, Edward P. Botsford, William T. Dunn, Alvin K. Riley and George Rollings.

The American Stoker Co., of Brooklyn, N. Y., capital $500,000, has been incorporated, to buy the rights and business of the American Stoker Co., of Dayton, O., and to continue the business. The directors are: Royal C. Peabody, David H. Valentine, Alfred J. Pouch, Frank Field, Henry Batterman, Hugh W. Fullerton and William S. Barstow, of Brooklyn. The offices of the company are 72-74 Garfield Bldg., Brooklyn.

New Construction:—

The F. M. Davis Iron Works Co., Denver, Colo., has purchased a site for a new shop for the manufacture of improved mining machinery. It will be supplied with hydraulic compressed air and electrical appliances and cost $100,000 to $200,000. The old quarters are to be used for foundry and black-smith shop purposes in connection with the new plant.

Geo. E. Turner, of the Turner Engineering Co., Marion, O., has about completed plans for the new shops of the company, which will be built as soon as the weather permits. The building will be constructed entirely of steel, and will be modern in every particular. It will be 90 feet wide and 100 feet long, will contain an overhead railway and cranes capable of lifting many tons, which will be used to convey boilers and other heavy material to the various parts of the building. A commodious office and outbuildings have also been arranged.

It is reported that the Falcon Iron & Nail Co., at Niles, O., will construct a machine shop and two new gas furnaces at its works during the holiday shut down.

Additions, Enlargements, Removals, Etc.:—

The armory at Newburgh, N. Y., is to be enlarged and improved. The drill hall is about 80 feet wide and 130 feet long. Among the contemplated improvements is the removing of the present wooden roof and replacing it with a new roof structure. The roof supports will consist of 11 steel trusses. These will be arranged to support the mezzanine floor where new lockers and equipment cases will be placed, and they will also support the visitor's gallery. The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract for furnishing and erecting the steel trusses, as well as the other iron work in the building, consisting of steel plates in the rifle pit, girders in the floor and walls, and other miscellaneous iron work.

The Union Iron & Steel Co., of Youngstown, O., is erecting a new building at its Warren, O., plant, which will be used as a roll turning and machine shop.

The Heilman Boiler Works, at Uniontown, Pa., are being enlarged by an addition, 25x50 feet.

A new building has been added to the Williams Iron Works, at Ravenna, O. Forty more men will be at work on new machines, making a total of 175 employes, all skilled workmen.

Fires and Accidents:—

The Pen Argyl Iron Works of S. Barton, at Pen Argyl, Pa., were destroyed by fire Dec. 20, with loss of $25,000; insurance, $8,000. Hoisting engines were manufactured.

General Industrial Notes:—

The Walker Co., of Cleveland, has closed a contract with Wm. W. Bierce, of New Orleans, to supply him with cotton compresses. The weight of a compress complete is 150 tons. The steel cylinders will be furnished by the Otis Steel Co. and the forged steel links by the Cleveland City Forge & Iron Co.

The perforating works of A. J. Beckley & Co., of Garwood, N. J., are busy on mining screens for Western mines, and have orders for 100 screens for the Klondike placer mining district, which are soon to be shipped to the Pacific Coast.

The Southern agency of the Lidgerwood Mfg. Co., New York, builders of the Lidgerwood hoisting engines, cableways and conveying devices for contractors and others, has been placed with the firm of Woodward, Wight & Co., Ltd. New Orleans, La. With this connection and having Mr. J. H Dickinson as engineer in charge of all specifications and orders, the Lidgerwood Co. insures to its customers good service from an engineering standpoint and prompt filling of all orders.

At Hamilton, O., Wm. and Moses Mosler, of the Mosler Safe & Lock Co., filed a suit in common pleas court for the appointment of a receiver for the Harring-Hall-Marvin Safe & Lock Co., as far as its property is located in Ohio. S. D. Fitton, president of the First National Bank, of Hamilton, was made receiver, and qualified by giving bond in $50,000.

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Proprietors of the CELEBRATED Mount Savage Fire Brick

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Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

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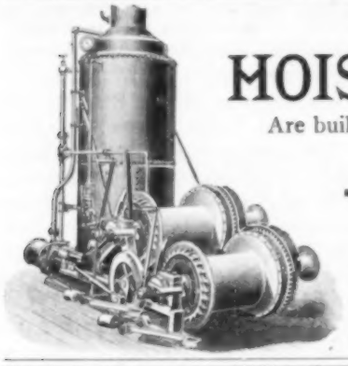
MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.



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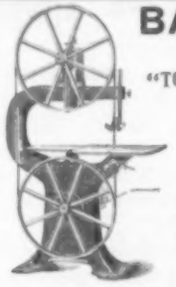

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Plaintiffs say the company has total indebtedness of $300,000, and that the real estate and assets ought to be applied to paying Ohio indebtedness. Another application for a receiver was made in New Jersey. The company's assets in August, at the last annual report, were reported as being $1,484,321; liabilities, $270,963; net assets, $1,213,358.

Referee F. H. Watters, in the case brought at Akron, O., against the P., A. & W. Railroad Co., et al. to determine statutory liability, finds the company indebted to the Carnegie Steel Co. to the amount of $87,640 and to others in sums footing up $9,081.43. The amount assessed against the Central Trust Co., of New York, under its liability, is $100,350, and against each of five nominal stockholders, $4.02.

A Birmingham, Ala., dispatch says that the Coronna Coal Co. and the Virginia & Alabama Coal Co., employing about 1,200 coal miners in Walker county, Ala., have announced that on Jan. 1 they will advance wages from 60 to 70 cents a ton.

At a meeting of the stockholders of the Kimberly mills, located at Sharon and Greenville, Pa., it was decided to issue $125,000 in gold bonds, bearing 6 per cent interest, $25,000 of which will be reserved for working capital and the remainder to be used in paying the indebtedness of the company. The Greenville mill will be started at once if the citizens subscribe $15,000, to which they have agreed. Both mills will be put in steady operation. The Sharon mill has been idle three years.

At the Duquesne Steel Works of the Carnegie Steel Co., 205 heats of Bessemer steel were blown in the 24 hours ending on Wednesday morning, Dec. 22, making a total output of 2,250 tons. This run is said to be the largest ever made and breaks all records for the production of Bessemer steel. The blowing plant has lately been improved by the addition of an Allis engine, enabling the mill to blow nearly one-third more heats than heretofore.

The rope wheels to be used in the power transmission plant of the Shenango Tin Plate Co.'s works, at New Castle, will be 22 feet 6 inches in diameter and 14 feet face, and will weigh 130 tons. They will be cast in sections, and finished for two-inch driving rope. There will be 11 of these wheels built by the A. P. Allis Co., of Milwaukee, Wis.

The Pittsburg, Bessemer & Lake Erie Railway has placed an order with the Ohio Falls Car Co. for 100 new box cars.

The Safe Deposit & Trust Co., of Pittsburg, has filed a bill in equity against the Duquesne Tube Works Co., asking that a certain mortgage be declared a lien on the defendant company's property. On Sept. 1, 1893, the defendant company issued $40,000 worth of bonds to the Tyrone Iron Co., and

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$60,000 to W. A. Dunshee. The plaintiff became trustees of the mortgage given to the Tyrone Iron Co. It is alleged that the defendant company has defaulted on the bonds, and the trustee wants an order to sell the mortgaged premises.

Nearly every furnace in the Pennsylvania Steel Co.'s open-hearth steel mills, at Steelton, is in operation, and repair work on others is being rushed.

The American Woodworking Machine Co., New York, has been organized with $4,000,000 capital stock. It is a combination of many of the oldest concerns in this line of business in the Eastern, Middle and Western States, under one management. The officers are: President, Wm. Duryea; treasurer, R. W. Perkins, Norwich, Conn.; secretary, Frank W. Duryea, New York.

The question of combining the interests of the New Castle Steel & Tin Plate Co. with those of other concerns in New Castle, came before the directors of the company at the annual meeting held on Tuesday. It was thoroughly discussed, and the directors refused to ratify the scheme.

At the upper mill of the Union Iron & Steel Co., at Youngstown, O., the new continuous mill is well under way.

The Bloomsburg Car Mfg. Co., Bloomsburg, Pa., is now running full time, chiefly on execution of foreign orders, and is receiving an unusually large number of inquiries.

The principal product of the Vinton Steel Works, Vinton, Iowa, just organized with a capital of $10,000, will be steel ceilings and cornices.

The Standard Boiler Co., of Chicago, contemplates changing its plant. It is intended to make tanks principally for gas and oil purposes, but should the company secure orders for boilers of the Standard type they will be built.

The Tennessee Coal, Iron & Railroad Co. reports for November are as follows: Net earnings, $51,500, an increase of $6,698. From Jan. 1 to Nov. 30 net earnings were $521,190, a decrease of $146,831; deficit after charges, $4,357, an increase of $145,654.

Satisfactory arrangements having been made with railroad companies for the delivery of iron ore from Wisconsin and Michigan mines during the winter, the Illinois Steel Co. has blown in the two furnaces of its Union Works, located in Chicago on Archer ave. The company now has 16 stacks in operation, covering its full furnace capacity. While it has 17 in all, it can only operate one of the two North Works furnaces at a time.

The Peoria Steel & Iron Works have been incorporated, with a capital stock of $200,000, to operate the rolling mill at Peoria, Ill., which has so long been idle.

The Jennings Steel Co., Ltd., has been organized and has leased the plant of the West Penn Steel Works, situated on Preble avenue, Allegheny, Pa. The plant contains one 10-gross ton Siemens-Martin open-hearth steel furnace, three heating furnaces, one 8-ton hammer and two trains of rolls, one 14-inch and one 18-inch. The concern will manufacture light plate steel, fine strip steel pickled, to be used for stamping purposes, and Siemens-Martin open-hearth steel sheet bars. The concern has already received a large number of orders and is operating its plant full time. Benjamin F. Jennings is chairman and treasurer and Wm. N. Howard secretary.

At Pittsburg the Pennsylvania Tube Works Co. has purchased the old John Robson & Sons coke plant and chain works property, comprising nearly all the land between Dam No. 1 and the purchaser's big plant on Second avenue. The tract contains six acres and the purchase price was $100,000. The new tract may be used to extend the tube works, but it is also stated that the new Pennsylvania Car Wheel Co., in which Joshua Rhodes, president of the tube company, is prominent may use a part of the land as the site of its works.

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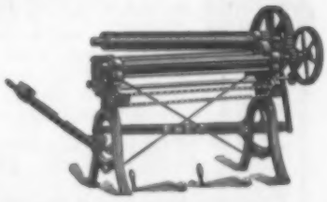

THE CLONBROCK STEAM BOILER CO.,

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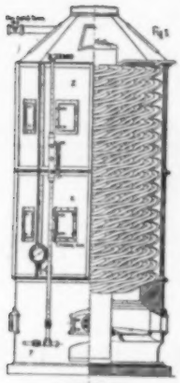

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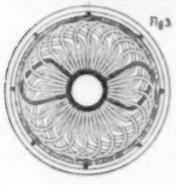

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

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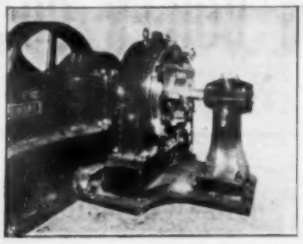

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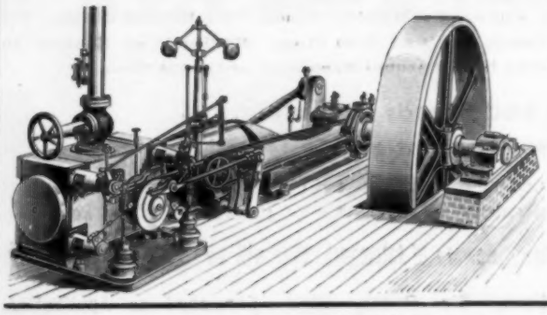

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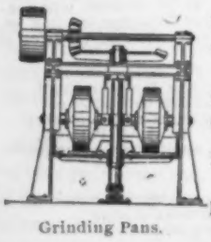

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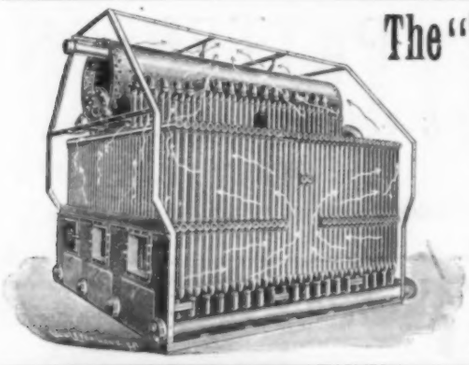

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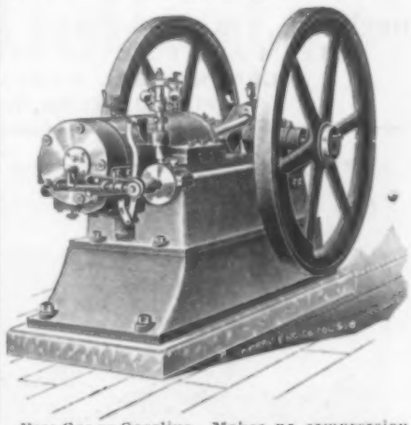

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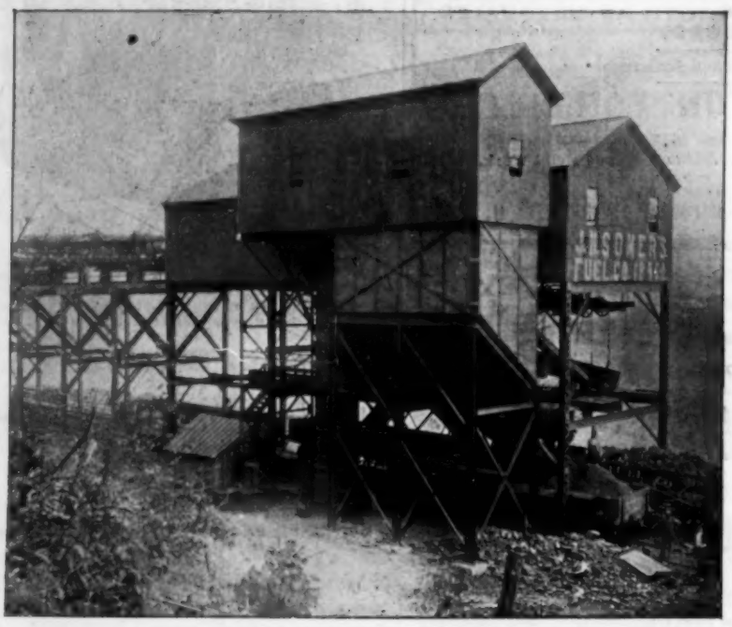

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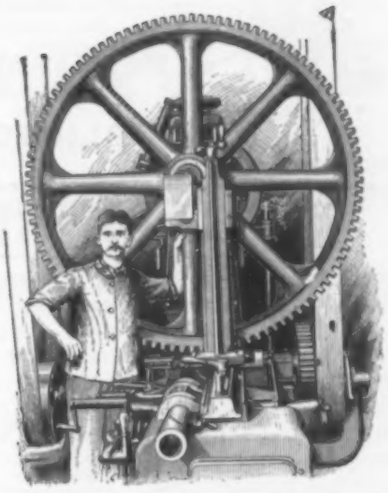

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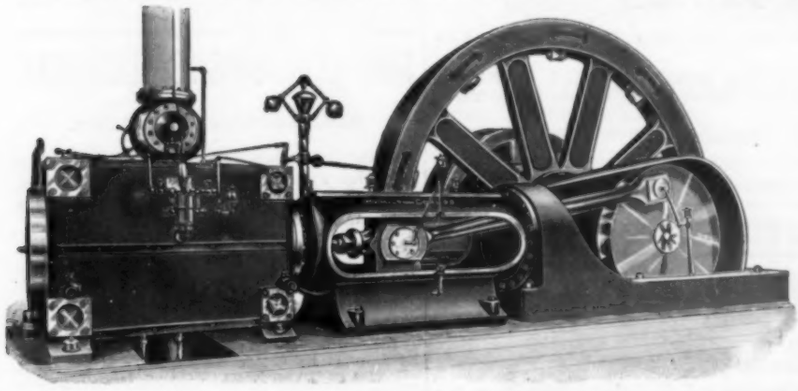

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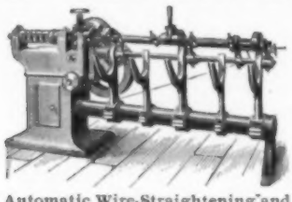

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Bethlehem Iron Co., South Bethlehem, Pa.

Friction Metal—
Magnolia Metal Co., New York City.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Plavford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Gas Engines—
Charter Gas Engine Co., Sterling, Ill.
Columbus Machine Co., Columbus, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Grip Sockets—
M. L. Andrew & Co., Cincinnati, O.

Hack Saws—
Millers Falls Co., New York City.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Cleveland, O.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
Burr Mfg. Co., Cleveland, O.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Heating and Ventilating Apparatus—
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.

Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Case Mfg. Co., Columbus, O.
Earl C. Bacon, New York City.
Burr Mfg. Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.
E. H. Stroud & Co., Chicago, Ill.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Chas. F. Rand, Prest., New York City.

Iron Working Tools—
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Wm. Glader, Chicago, Ill.
Fox Machine Co., Grand Rapids, Mich.
Wm. C. Thayer, Cleveland, O.
M. L. Andrew & Co., Cincinnati, O.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.

Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Wm. Glader, Chicago, Ill.

Lubricators—
The Lunkenheimer Co., Cincinnati, O.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati.
Wm. Glader, Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
Pittsburg Valve & Machine Co., Ltd., Allegheny, Pa.

Machinery and Tool Steel—
W. H. Bosworth, Cleveland, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Magnolia Metal—
Magnolia Metal Co., New York City.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Stamping—
Oliver P. Clay Co., Cleveland, O.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.

Mining Machinery—
The Bucyrus Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.

Motors—
Westinghouse, Church, Kerr & Co., New York City.
Westinghouse Electric & Mfg. Co., Pittsburg.
Card Electric Co., Mansfield, O.
Fisher Electrical Mfg. Co., Detroit, Mich.

Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.

Molding Sand—
Ohio Sand Co., Conneaut, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis
Gates Iron Works, Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.

Ore Screens—
A. J. Beckley & Co., Garwood, N. J.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
A. J. Beckley & Co., Garwood N. J.

Phosphor Bronze Castings—
Lorain Foundry Co., Lorain, O

Pig Iron—
Pickands, Brown & Co., Chicago, Ill.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill
Miller, Wagoner & Bentley, Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.
Superior Charcoal Iron Co., Detroit, Mich.

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Pipe
W. H. Bosworth, Cleveland, O.

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U. Baird Machinery Co., Pittsburg, Pa.

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Clayton Air Compressor Works, New York.

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B. F. Sturtevant Co., Boston, Mass.

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Bertsch & Co., Cambridge City, Ind.
Long & Allstattar Co., Hamilton, O.

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The Lane & Bodley Co., Cincinnati, O.

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Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Long & Allstatter Co., Hamilton, O.

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The Lane & Bodley Co., Cincinnati, O.

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Henry R. Worthington, Brooklyn, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.
Pittsburg Valve & Machine Co., Ltd., Allgheny, Pa.

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Walker Bros., Lansing, Mich.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Railroad Brasses—
Magnolia Metal Co., New York City.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.

Riveting Machinery—
Wm. H. Wood, Media, Pa.

Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Rolling Mill Machinery—
The Lloyd Booth Co., Youngstown, O.

Roofs—
Shiffler Bridge Co., Pittsburg.

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Burr Mfg. Co., Cleveland, O.

Sand and Chill Rolls—
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Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland, O.

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Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

Screws—
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Upson Nut Co., Cleveland, O
Chicago Screw Co., Chicago, Ill.

Semi-Steel—
The King & Andrews Co., Chicago, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Long & Allstatter Co., Hamilton, O.
Fox Machine Co., Grand Rapids, Mich.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.

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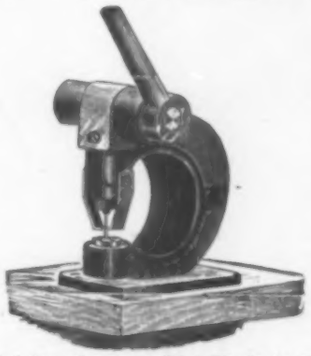

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"Metallurgy of Cast Iron,"
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Steam Shovels and Dredges—
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Marion Steam Shovel Co., Marion, O.

Steam Specialties—
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Steel—
Otis Steel Co., Cleveland, O.
Miller, Wagoner & Bentley, Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.

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The King & Andrews Co., Chicago, Ill.
Otis Steel Co., Cleveland, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland
Bethlehem Iron Co., South Bethlehem,
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Westinghouse, Church, Kerr & Co., New York City.

Tackle Blocks—
Burr Mfg. Co., Cleveland, O.

Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Williams Mfg. Co., Kalamazoo, Mich.

Tinning Machinery—
W. H. Bosworth, Cleveland, O.
The Lloyd Booth Co., Youngstown, O.

Tin Plate—
Ætna-Standard Iron & Steel Co., Bridgeport, O

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill
E. H. Stroud & Co., Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.

Transmission Machinery—
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.

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S. Fix Sons, Cleveland, O.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.
W. H. Bosworth, Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.

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B. F. Sturtevant Co., Boston Mass.

Wheelbarrows—
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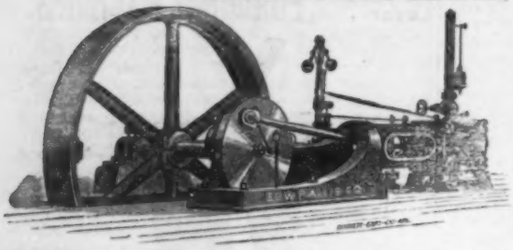
Lansing Wheelbarrow Co., Lansing, Mich.

Wire Machinery—
John Adt & Son New Haven Conn.
Wm. Glader, Chicago, Ill.

Wire Nail Machinery—
Wm. Glader, Chicago, Ill.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

ICE and REFRIGERATING MACHINERY, Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills. Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO PITTSBURG.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@3.46
No. 1 Specular, Bessemer	3.05@3.17
No. 1 Bessemer hematite	2.60@2.90
Hematites No. 1 non-Bessemer	2.00@2.25
No 1. Specular, non-Bessemer	2.40@2.60

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ 10 15
No. 1 Strong Foundry	10 50@10 75
No. 2 Strong Foundry	..... 10 15
Gray Forge, red short	..... 9 00
Gray Forge, neutral	..... 9 15
No. 1 American Scotch	10 65@10 75
No. 2 American Scotch	10 15@10 25
Lake Superior Charcoal	..... 12 00
PITTSBURG:	
No. 1 Foundry	$10 75@10 90
No. 2 Foundry	10 25@10 40
Gray Forge	..... 9 00
White and Mottled	..... 8 75
Warm Blast Charcoal	13 00@13 50
Cold Blast Charcoal	..... 16 00
Bessemer	10 00@10 15
CHICAGO:	
Lake Superior Charcoal	$12 50@$13 00
Local Coke Foundry No. 1	11 00@11 50
Local Coke Foundry No. 2	10 50@11 00
Local Coke Foundry No. 3	10 25@10 50
Local Scotch Foundry No. 1	11 50@12 00
Local Scotch Foundry No. 2	11 00@11 50
Local Scotch Foundry No. 3	10 50@11 00
Southern Coke No. 1	11 00@11 25
Southern Coke No. 2	10 60@10 85
Southern Coke No. 3	10 35@10 60
Southern No. 1 Soft	11 00@11 25
Southern No. 2 Soft	10 60@10 85
Southern Silveries	11 25@11 50
Jackson Co. Silveries	12 50@14 50
Ohio Silveries No. 1	.....@.....
Ohio Strong Softeners	12 00@12 25
Alabama Car Wheel	16 00@17 00
Malleable Bessemer	10 75@11 00
Coke Bessemer	11 50@12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 10 00
Southern Coke No. 2 and No. 1 Soft	..... 9 75
Hanging Rock Coke, No 1	..... 9 45
Hanging Rock Charcoal No. 1, Fdy	14 50@15 50
Tennessee Charcoal No 1	12 50@13 00
Jackson County Silvery No 1	12 50@13 00
Southern Coke, Gray Forge	..... 9 25
" " Mottled	..... 9 00
Standard Georgia Car Wheel	14 25@15 00
Tennessee " "	13 00@14 00
Lake Superior " "	14 25@14 50
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	..... 11 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	..... 10 75
Ohio Strong Softener No. 1	..... 11 75
Jackson Co. Silvery No. 1	..... 14 00
Lake Superior Charcoal	..... 15 50
Southern Soft No. 1	..... 11 75
Hanging Rock Charcoal	..... 17 00
ST. LOUIS:	
Southern Coke No 1	$10 50@$10 75
Southern Coke No. 2	..... 10 25
Southern Coke No. 3	9 75@10 00
Southern Gray Forge	..... 9 75
Southern Charcoal No. 1	..... 12 50
Missouri Bessemer	..... 13 00
Ohio Softeners	..... 14 00
Lake Superior Car Wheel	..... 13 50
Southern Car Wheel	..... 13 25

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$14 00
Old steel rails (6 ft. and over)	9 50
Old steel rails (6 ft. and under)	9 50
Old car wheels	11 00
	NET TONS
No. 1 R. R. wrought scrap	$10 50
Mill scrap	8 00
No. 1 Machine cast scrap	8 00
Iron axles	15 00
Axle turnings	8 00
Wrought turnings (free from cast)	6 00
Cast borings	5 25
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 00
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	6 50
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.20c
Angles	1.10c
Tees	1.25c
Universal Plates	1.10@1.15c
Sheared Plates	1.20c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.00 Base.
2 to 2⅞	.20 extra.
3 to 3⅛	.50 "
3⅜ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.20 "

6⅝ to 7¼	2.50 extra.
¾ to ⅞	.10 "
⅝ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1¾ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¾ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

to 8 x No 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1 40 "
⅜ x No. 9 to 3-16	1.50
⅜ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.....

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅞ to 1½	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
⅛ to 9-16 x 3-16	1.00 "
⅜ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4 50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes.....1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.
1¼ to 6,	" 10, 11, 12 or 1/4"	.05 per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or 1/4"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or 1/4"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or 1/4"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or 1/4"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or 1/4"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or 1/4"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or 1/4"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base. Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
7-16 to 2,	" 21	.15 "
1 -16 to 1¼,	" 22	.25 "
1 1/16 to 1⅜,	" 13, 14 and 15	.05 "
1¼ to 1⅜,	" 16,17 and 18	.10 "

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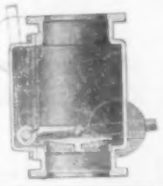

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This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

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Akron Tubular Steel Wheelbarrows.

For hauling **Coal, Ashes, Dirt** or any commodity in or about the **Mill, Foundry** or **Factory.** . . . . .

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Special hand-made pig iron barrows.

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CLEVELAND OHIO.

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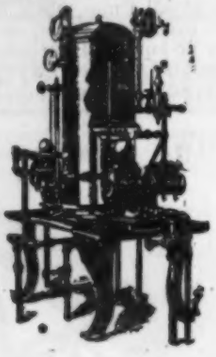

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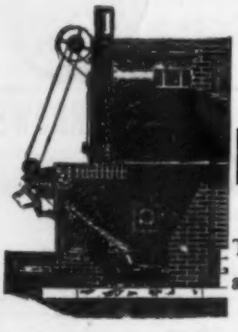

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THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

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For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

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If you need any paint it will pay you to send for circular.

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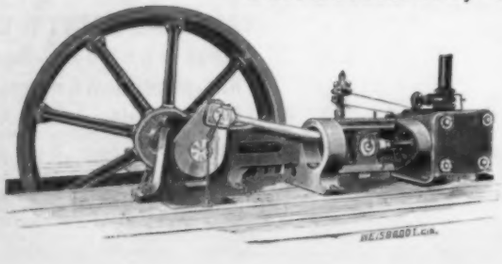

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ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pullers.

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1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
⅜,	"	13, 14 and 15	1.00 "
⅜,	"	16, 17 and 18	1.10 "
⅜,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price, 1 40
Open-hearth Tire	" 1 45
Open-hearth Spring	" 1 80
Sleigh Shoe	" 1 45
Toe Calk	" 1 90
Cutter Shoes, tapered and bent	" 1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ⅞ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅛ to 4 in.	.09½
⅜ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10½
¼ to 9-32 and 6⅛ to 7 in	.11
1 in.	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 co
Bridge ½, ⅝, 11-16 and ¾ inch diam.	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, and 10 per cent.	.78
Butt " " " "	.72
Lap " galv. " "	.70
Butt " " " "	.67
Boiler tubes 2¼" and smaller	.72½
Boiler tubes 2½" and larger	.75
Casting screw and socket joint	dis. 50
Casing inserted joint	dis. 45

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[From Store, Cleveland.]

Anti-Friction Metals.

Magnolia Anti-Friction Metal, 25 cts. per lb., f. o. b. New York or Chicago.

No Name Metal, 18 cts. per lb., f. o. b. New York or Chicago.

Mystic Metal. 8 cts. per lb., f. o. b. New York or Chicago.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard .....dis 10 & 10
" " " extra.....dis 60&10
" " " best.....dis 55
Cleveland Rubber Co. extra standard.....dis 60&10
Hoyt's Short Lap.....dis 50
Shults Raw Hide Leather Belting, single,.....dis 40
Munson's Short Lap Single Leather.....dis 50
Munson's Short Lap Double and Light Double Leather.....dis 50&10
Shults Raw Hide Leather Belting, Double and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned.....dis

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 80
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent .....dis 40
" Little Giant Drill.....dis 33⅓
Horton's Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 45
Sweetland " .....dis 40
Almond Drill.....dis 40
Morse " .....dis 20
Skinner's Combination Lathe.....dis 40&15
" Independent Lathe.....dis 40&10
" Universal Lathe..... .....dis 40&10
" Drill.....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
6tandard .....dis 10@1
Morse.....dis 10 to 15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ 3½
Iron, steel points.....₩ lb 1

Drill and Drill Sockets.

Twist Drills
Morse Taper&Straight Shank to 1½"dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills..... .....dis 60@60&5
Cleveland " " ....dis 60@60&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 50@50&5
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Crant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton .....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's .....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W .....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....10c
" " " over 5 lbs..... 8c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅝	11⅛	8⅛	6	5¾	5¼	
Washers	9	8	7	5	4⅛	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.
{ Car lots.....$1.50
{ Less than car lots...$1.65

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Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

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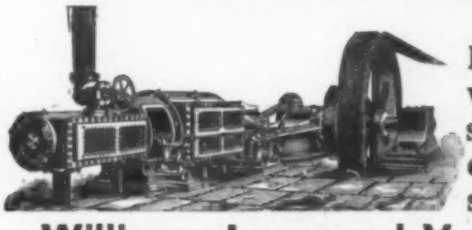

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Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

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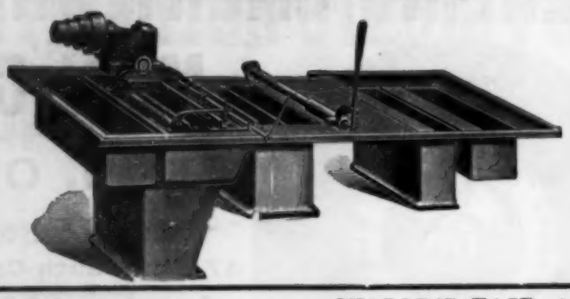

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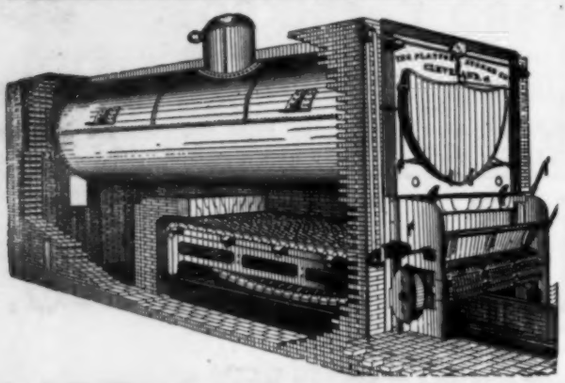
SYKES IRON & STEEL ROOFING CO., Chicago and Niles, O.



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Abolish smoke, to increase boiler capacity and to save fuel.

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CLEVELAND, O.

Rivets.

Iron, Thousand, list November 1, 1894	dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894	dis 60@65
Copper	dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in.	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

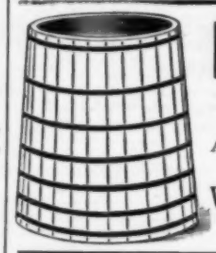
Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Apr. 9, 1894

Brass	dis 35c
Copper	dis 35c
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30



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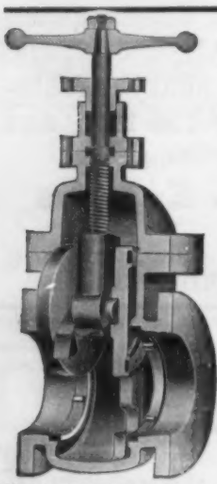

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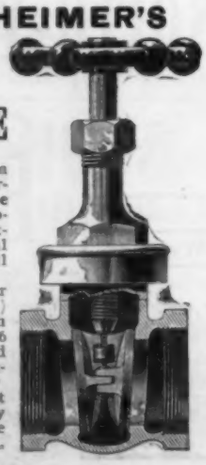

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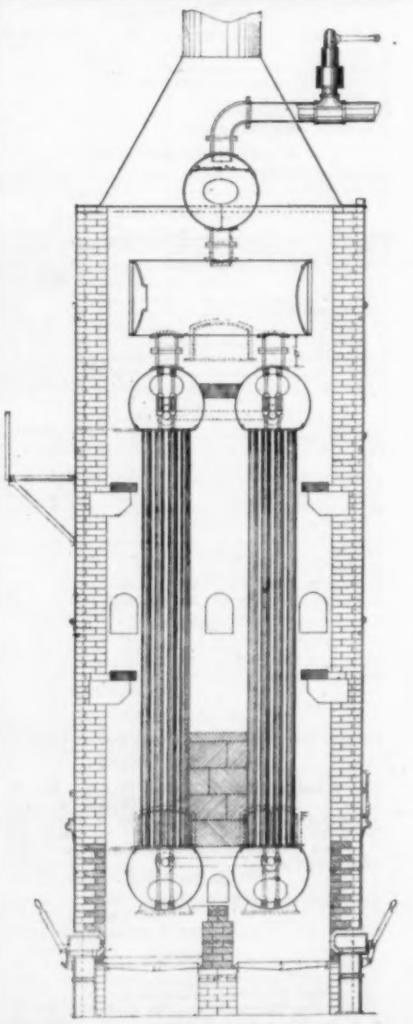

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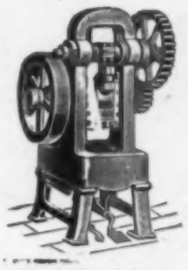

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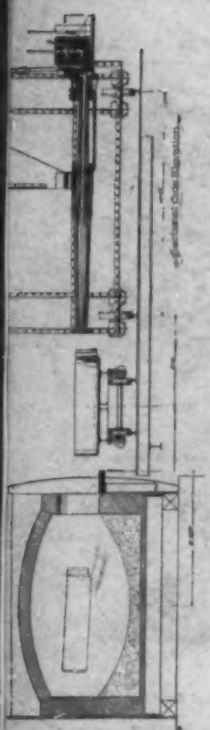

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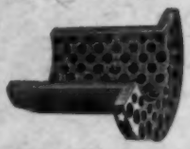

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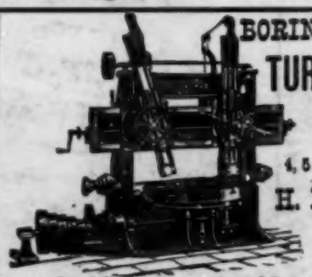

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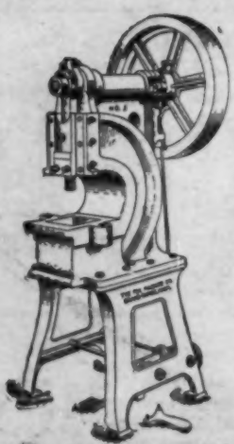

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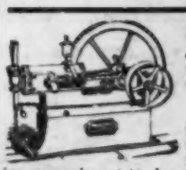

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